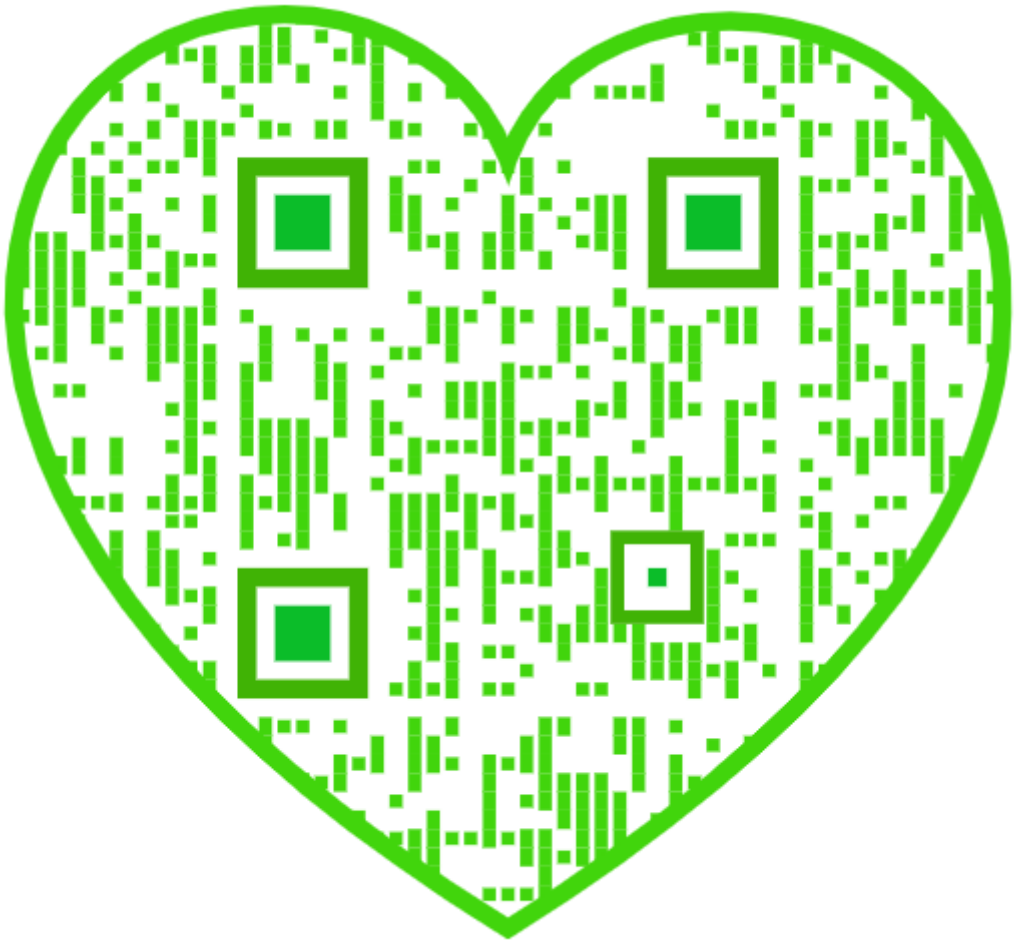
3 1761 06704743 1



Digitized by the Internet Archive
in 2007 with funding from
Microsoft Corporation

http://www.archive.org/details/shortpracticeofm00jelluoft

A SHORT PRACTICE OF MIDWIFERY

By the same Author

A SHORT PRACTICE OF GYNÆCOLOGY

THIRD EDITION

With 310 Illustrations. Small Royal 8vo.

12*s.* 6*d.* net.

A SHORT PRACTICE OF MIDWIFERY FOR NURSES

SECOND EDITION

With 5 Plates and 133 Illustrations. Crown 8vo.

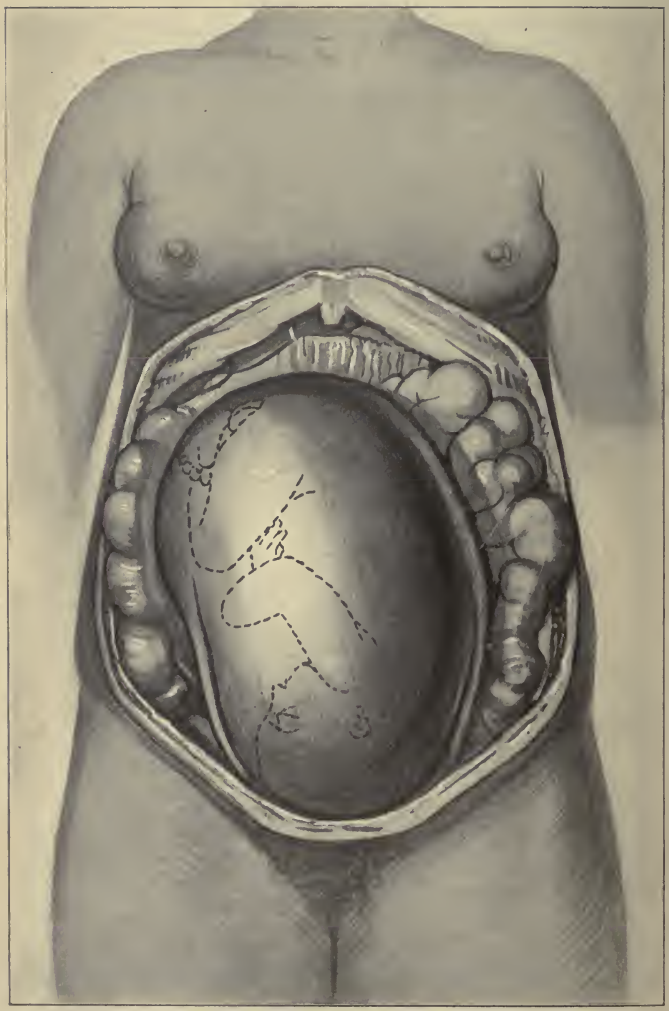
6*s.* 6*d.* net.

A MANUAL OF MIDWIFERY

With 9 Plates and 467 Illustrations. Demy 8vo.

21*s.* net.

PLATE I.



The full term Uterus.

M.G.O.
J.

A SHORT PRACTICE OF MIDWIFERY

EMBODYING THE TREATMENT ADOPTED IN THE ROTUNDA HOSPITAL, DUBLIN

BY

HENRY JELLETT, B.A., M.D. (DUBLIN UNIVERSITY), F.R.C.P.I.,

GYNÆCOLOGIST AND OBSTETRICAL PHYSICIAN, DR. STEEVENS' HOSPITAL; EX-ASSISTANT MASTER, ROTUNDA HOSPITAL; CENSOR AND EXAMINER IN MIDWIFERY, ROYAL COLLEGE OF PHYSICIANS, IRELAND; FORMERLY VICE-PRESIDENT BRITISH GYNÆCOLOGICAL SOCIETY; LATE UNIVERSITY EXAMINER IN MIDWIFERY AND GYNÆCOLOGY, DUBLIN UNIVERSITY; LATE EXTERN EXAMINER IN MIDWIFERY AND GYNÆCOLOGY, ROYAL UNIVERSITY OF IRELAND

WITH A PREFACE BY

SIR W. J. SMYLY, M.D., F.R.C.P.I.

LATE MASTER OF THE ROTUNDA HOSPITAL

FIFTH EDITION, REVISED

SECOND 10,000

With 200 Illustrations, and an Appendix containing the Statistics of the Hospital for the last seventeen years

LONDON

J. & A. CHURCHILL

7 GREAT MARLBOROUGH STREET

1908

9461/7
20/1/09

PRINTED BY ADLARD AND SON
LONDON AND DORKING

PREFACE

I AM sure that Dr. Jellett's little book will prove acceptable to many practitioners and students who desire a succinct account of the methods adopted in the Rotunda Hospital, in the management of parturient women. In many particulars the views expressed are at variance with the rules laid down in most text-books, and I may here emphasise a few of these. It has been shown that, whereas in hospitals the introduction of antiseptics has been followed by most gratifying results, in private practice little if any improvement is observable. To account for this deplorable state of affairs, it has been pointed out that proper precautions are not so universally adopted by practitioners and nurses as they should be; and also, on the other hand, that too much reliance upon antiseptic methods has encouraged "meddlesome midwifery"; so that what has been gained by the former has been sacrificed by the

latter. The recommendations in this work regarding the substitution, as far as possible, of external for internal manipulations; the avoidance of routine douching, of the use of the plug in abortions and placenta prævia, and of the forceps in cases where the head has not passed the pelvic brim; and the management of the third stage of labour, are matters of the greatest importance. I am entirely in accord with the statement that a practitioner can appraise his own merits by the infrequency of post-partum hæmorrhage in his practice.

The subjects, which will probably provoke most criticism, are the methods of treatment recommended in accidental hæmorrhage and eclampsia. In the first two years of my Mastership, I treated all serious cases of accidental hæmorrhage by rupturing the membranes; and, if that did not prove effectual, delivery was effected by version and extraction or perforation. The results were so bad that I resorted to plugging in all cases of external accidental hæmorrhage in which the membranes were intact, and labour pains absent or feeble—that is in the great majority of cases—and with excellent results. The fear that an external would be converted into an internal hæmorrhage proved groundless. The use of chloroform in puerperal eclampsia I abandoned with the greatest reluctance. Nothing is more gratifying to the practitioner himself and

the relatives of the patient than the complete control of the convulsions by chloroform, but it does not save the patient's life; on the contrary, it increases the tendency to death.

Even to those who differ from the views advanced, this little work will afford matter for reflection, especially as the results of the treatment advocated can be judged from the statistics appended.

W. J. SMYLY, M.D., F.R.C.P.I.,
Ex-Master of the Rotunda Hospital, Dublin.

AUTHOR'S PREFACE TO THE FIRST EDITION

The following short Practice of Midwifery has been written with the object of giving a concise and practical description of the treatment, which has been so successfully carried out in the Rotunda Hospital under the mastership of Dr. W. J. Smyly; and which is still followed by his successor, Dr. R. D. Purefoy. I feel that it is necessary to offer an excuse for the publication of another handbook of midwifery, when so very many are in existence. My excuse is twofold. I have written this little work, first, because I was requested to do so by several of the students attending the Hospital; secondly, because the extremely successful results, following the treatment adopted here, seem to warrant its publication. I have also given, in the form of an appendix, statistics of the various cases treated in the Hospital. It will be seen, from

them, what a striking improvement has occurred in the rate of maternal mortality. The treatment which I describe is that which has been selected in accordance with the experience of these years, and which, during the last year, has yielded the extremely low maternal mortality of 0·06 per cent.

I wish here to express my deep sense of the kindness of Dr. Smyly, in permitting me to publish his teaching in this form. I trust that the extreme clearness and science of his teaching will not be so obscured by my shortcomings, as to render it less obvious to those who read it in this book than it has been to those who have heard it from himself. Further, I wish to express my thanks to Dr. Purefoy, who has permitted me to associate the book with the Rotunda Hospital.

HENRY JELLETT.

Rotunda Hospital, Dublin;
March, 1897.

PREFACE TO THE FIFTH EDITION

I HAVE made several changes in the sequence of chapters in the present edition of this book, so that it may be similar in point of arrangement to my larger 'Manual of Midwifery.' Students and others will therefore find that the two books are, so to speak, complementary to one another. A large number of illustrations has been added, and the text has been brought thoroughly up to date, and in places has been rewritten. The statistics of the Rotunda Hospital for the past four years have also been added, and the statistics of previous years have been tabulated in a more concise manner. In all 25,790 cases of labour are analysed.

I am deeply indebted to my friends, Dr. Kirkpatrick, Dr. Moorhead, and Dr. Stevenson, for kindly reading the proof sheets for me.

HENRY JELLETT.

61, LOWER MOUNT STREET,
MERRION SQUARE, DUBLIN;
May, 1908.

CONTENTS

CHAPTER I.

ASEPSIS IN MIDWIFERY.

PAGE

Importance of Asepsis in Midwifery—Mechanism by which the Uterus is kept Aseptic during Pregnancy and Labour —The Vaginal Secretion—The Operculum—Method of Sterilising the Hands and the Instruments—Prophylactic Douching—Douching Solutions—Preparation of Patient for an Obstetrical Operation 1

CHAPTER II.

THE BONY PELVIS.

The Bony Pelvis—The Diameters of the Pelvis—The Inclined Planes 9

CHAPTER III.

THE OVUM.

Constitution of the Ovum: Placenta; Chorion; Amnion; Umbilical Cord; Liquor Amnii; Fœtus, Sizes of at different months, Fœtal Skull, Fœtal Circulation, Attitude of Fœtus, Presentation, Position 16

CHAPTER IV.

OBSTETRICAL DIAGNOSIS.

Methods of Examination: Abdominal Palpation, Vaginal Examination, Auscultation 46

CHAPTER V.

PREGNANCY AND ITS PHENOMENA.

PAGE

Definition—Duration—Phenomena of: Changes in the Uterus, the Decidua: Changes in remainder of Genital Tract, Vagina, Tubes, Ovaries, Ligaments: Changes in Pelvic Joints: Breast Changes: Mechanical Effect of Growing Uterus: Remote Effects of Pregnancy, Circulation, Respiration, Urinary System, Digestive System, Nervous System, Pigmentation 80

CHAPTER VI.

THE DIAGNOSIS AND MANAGEMENT OF PREGNANCY.

The Diagnosis of Pregnancy—Subjective Symptoms—Objective Symptoms—The Doubtful, Probable, and Certain Signs of Pregnancy—Estimation of the Date of Pregnancy—Is the Fœtus Alive or Dead?—Management of Pregnancy 101

CHAPTER VII.

LABOUR AND ITS PHENOMENA.

Definition of Labour—Causes—Stages—Phenomena, Uterine Contractions, Accessory Muscles of Labour, Effect of Uterine Contractions—Symptoms, Normal Labour, Abnormal Labour—Diagnosis 116

CHAPTER VIII.

CEPHALIC PRESENTATIONS.

Vertex Presentation: Definition, Frequency, Ætiology, Positions, Diagnosis, Mechanism, Abnormal Mechanism, Moulding 153

CHAPTER IX.

THE MANAGEMENT OF NORMAL LABOUR.

Definition of Normal Labour—Preparations for—Obstetrical Couch—Obstetrical Armamentarium—Management of Normal Labour, First Stage, Second Stage—Methods of Preserving the Perinæum—Care of the Funis after the Birth of the Head—Management of the Third Stage—Ligation of the Cord—Expulsion of the Placenta—"The Dublin Method"—Method of determining whether the Placenta is in the Uterus or in the Vagina—Ergot—Anæsthesia 176

CHAPTER X.

CEPHALIC PRESENTATIONS (*continued*).

PAGE

Face Presentation: Frequency—Ætiology—Positions—Diagnosis—Mechanism—Abnormal Mechanism—Moulding of Head—Treatment—Prognosis. Brow Presentation: Frequency—Ætiology—Positions—Diagnosis—Mechanism—Moulding of Head—Prognosis—Treatment. Anterior Fontanelle Presentation. Posterior Fontanelle Presentation 210

CHAPTER XI.

PELVIC PRESENTATION.

Pelvic Presentation: Frequency—Ætiology—Positions—Diagnosis—Mechanism—Abnormal Mechanism—Moulding—Treatment—Method of bringing down an Extended Arm—Methods of delivering the After-coming Head; a Modification of the Prague Method, Martin's Method, Smellie's Method—Prognosis 234

CHAPTER XII.

TRANSVERSE PRESENTATION.

Frequency—Ætiology—Positions—Diagnosis—Mechanism; Spontaneous Evolution—Spontaneous Version, *Corpore Conduplicato*—Treatment 253

CHAPTER XIII.

MULTIPLE PREGNANCY.

Varieties—Frequency—Twin Pregnancy—Ætiology—Diagnosis—Presentations—Course of Labour—Treatment—Prognosis—Complications: Locked Twins, Entangling of the Cords, Fœtus Papyraceus 263

CHAPTER XIV.

THE PUERPERIUM.

Physiological Phenomena—The Involution of the Uterus—The Lochia: Varieties, Amount—Lactation: Amount, Composition of Milk—Prognosis—Treatment—Complications: Subinvolution 268

CHAPTER XV.

THE DISORDERS OF PREGNANCY.

PAGE

Morning Sickness—Hyperemesis—Nephritis Gravidarum—Anæmia—Hydræmia—Varicose Veins—Hæmorrhoids—Salivation—Pyrosis—Pruritus Vulvæ—Neuralgia . . 277

CHAPTER XVI.

DISEASES OF THE DECIDUA AND OVUM.

Decidual Endometritis—Abnormal Permeability of the Membranes—Vesicular Mole—Chorion-epithelioma—Hydramnios—Oligohydramnios—Anomalies of the Placenta and Funis 292

CHAPTER XVII.

ERRORS OF POSITION, OR OF DEVELOPMENT, OF THE PREGNANT UTERUS.

Displacements of the Pregnant Uterus—Pathological Anteflexion—Pathological Anteversion—Retro-deviation—Incarceration of a Retro-deviated Uterus—Prolapse of the Uterus—Malformations of the Uterus . . . 309

CHAPTER XVIII.

ECLAMPSIA.

Definition—Frequency—Morbid Anatomy—Ætiology: Predisposing Conditions—Symptoms: Prodromal, Actual—Diagnosis—Complications—Treatment: Prophylactic, Curative, Chloroform Treatment, Morphia Treatment, Position of Patient, Feeding, Infusion of Saline Solution, Induction of Labour, Venesection, Prognosis . . . 318

CHAPTER XIX.

ABORTION—MISCARRIAGE—PREMATURE LABOUR—DELAYED LABOUR.

Abortion: Threatened Abortion, Cervical Abortion, Missed Abortion, Complete Abortion, Incomplete Abortion—Miscarriage—Premature Labour—Delayed Labour . . 335

CHAPTER XX.

EXTRA-UTERINE PREGNANCY.

PAGE

Course of Pregnancy—Varieties—Ætiology—Before Rupture of the Tube: Symptoms, Diagnosis, Treatment—At the Time of Rupture: Symptoms, Diagnosis, Treatment—After Rupture: Symptoms—Diagnosis—Treatment—Result of Fœtus remaining in the Abdomen—Table showing the Varieties of Extra-uterine Pregnancy and their Treatment 350

CHAPTER XXI.

ANTE-PARTUM HÆMORRHAGE.

Varieties—Hæmorrhage during fourth, fifth, and sixth months—Accidental Hæmorrhage: Varieties of Accidental Hæmorrhage—Concealed Accidental Hæmorrhage—External Accidental Hæmorrhage: Treatment by plugging the Vagina, Other Modes of Treatment—Unavoidable Hæmorrhage: Treatment by Braxton Hicks' Method, Other Modes of Treatment—Fœtal Mortality in Ante-partum Hæmorrhage 367

CHAPTER XXII.

PRECIPITATE LABOUR—UTERINE INERTIA—RETAINED PLACENTA.

Precipitate Labour—Uterine Inertia: Varieties—Primary Uterine Inertia—Secondary Uterine Inertia—Retained Placenta 389

CHAPTER XXIII.

CONTRACTED PELVIS.

Diameters of the Normal Pelvis—Varieties of Contracted Pelvis—The Common Forms of Contracted Pelvis—The Remaining Forms of Contracted Pelvis—Diagnosis—Mechanism of Generally Contracted Pelvis—Mechanism of Flat Pelvis—Mechanism of Generally Contracted Flat Pelvis—Treatment—Table of Degrees of Contraction—Walcher's Position—Time at which to induce Premature Labour—Müller's Method 396

CHAPTER XXIV.

OBSTRUCTED DELIVERY.

PAGE

Abnormalities on the part of the Mother: Contracted Pelvis —Tumours, of the Uterus, of the Vagina and Vulva, of the Pelvis, of the Ovaries—Stenosis and Atresia, of the Cervix, of the Vagina—Malformations of Uterus and Vagina—Malpositions of Uterus. Abnormalities on the part of the Fœtus: of Presentation, Position, Attitude— of Size—Malformations and Tumours—Monsters . . 436

CHAPTER XXV.

PROLAPSE OF THE CORD.

Difference between Presentation and Prolapse of the Cord— Ætiology—Diagnosis—Treatment: Reposition, Version, Forceps 456

CHAPTER XXVI.

POST-PARTUM HÆMORRHAGE.

Primary Post-partum Hæmorrhage—Varieties—Traumatic Post-partum Hæmorrhage—Atonic Post-partum Hæmorrhage: Plugging with Iodoform Gauze, Injection of Perchloride of Iron—Concealed Hæmorrhage—Secondary Post-partum Hæmorrhage—Post-hæmorrhagic Collapse —Infusion of Saline Solution 462

CHAPTER XXVII.

GENITAL INJURIES.

Hæmatoma of the Vagina and Vulva—Inversion of the Uterus —Rupture of the Uterus—Laceration of the Cervix— Laceration of the Perinæum 477

CHAPTER XXVIII.

SAPRÆMIA AND SEPTIC INFECTION.

Varieties—Sapræmic Infection: Ætiology, Symptoms, Prognosis, Treatment—Septic Infection: Ætiology, Consequences—Local Septic Infection: Symptoms, Treatment —General Septic Infection: Varieties—Lymphatic Sepsis: Symptoms, Prognosis, Treatment, Antistreptococcic Serum —Pyæmia: Ætiology, Symptoms, Prognosis, Treatment . 490

CHAPTER XXIX.

DISEASES ASSOCIATED WITH THE PUERPERIUM.

PAGE

Pulmonary Embolus—Sub-involution of the Uterus—Mastitis: Varieties—Parenchymatous Mastitis—Interstitial Mastitis—Crural Phlebo-thrombosis—Puerperal Insanity . 512

CHAPTER XXX.

ARTIFICIAL DILATATION OF CERVIX—INDUCTION OF ABORTION AND PREMATURE LABOUR.

Artificial Dilatation of the Cervix, by Incision of the Cervix, by Dilatation of the Cervix—Induction of Abortion—Induction of Premature Labour: Methods: Version, Plugging of the Vagina, Catheterisation of the Uterus, Intra-uterine Injection of Water or Glycerine, Dilatation of the Cervix, Rupture of the Membranes . . . 526

CHAPTER XXXI.

THE APPLICATION OF THE FORCEPS.

Varieties of Forceps—Neville's Axis Traction Forceps—Methods of using the Forceps—Conditions—Indications—Method of Application—The Forceps in Occipito-posterior Positions of the Vertex, in Face Presentation, in Brow Presentation, in Breech Presentation 540

CHAPTER XXXII.

VERSION—ARRESTED BREECH—IMPACTED SHOULDERS.

Version: Varieties—Cephalic Version: Indications, Methods, External Version, Bipolar Version—Podalic Version: Indications, Methods, External Version, Bipolar Version, Internal Version—Contra-indications to Version—Extraction in Pelvic Presentation—Impacted Shoulders . 554

CHAPTER XXXIII.

CONSERVATIVE CÆSAREAN SECTION—RADICAL CÆSAREAN SECTION—SYMPHYSIOTOMY—PUBIOTOMY.

PAGE

Conservative Cæsarean Section: Indications, Method—Radical Cæsarean Section: Indications, Operations—Symphysiotomy: Indications, Operation, After-treatment, Dangers—Pubiotomy: Indications, Operation, After-treatment, Dangers 568

CHAPTER XXXIV.

CRANIOTOMY AND EMBRYOTOMY.

Craniotomy: Perforation, Evacuation, Compression, Extraction—Perforation in the Case of a Face Presentation, in the Case of an After-coming Head—Embryotomy: Decapitation, Evisceration—Cleidotomy 582

CHAPTER XXXV.

THE INFANT—INFANT FEEDING.

Changes in the Infant after Birth—The Umbilical Cord—Temperature—Respiration—Pulse—Bowels—Urine—Weight—Breast Feeding—Artificial Feeding—Punctuality—Cleanliness—Suitable Food—Composition of Cow's and of Human Milk—Sterilisation of Milk, Pasteurisation—Farinaceous Foods 594

CHAPTER XXXVI.

INFANTILE DISEASES.

Asphyxia Neonatorum: Schultze's Method of Artificial Respiration—Cephalhæmatoma—Convulsions—Green Diarrhœa—Icterus Neonatorum—Late Hæmorrhage from the Cord—Mastitis—Ophthalmia Neonatorum—Retention of Urine—Strophulus—Thrush 609

A SHORT
PRACTICE OF MIDWIFERY.

CHAPTER I.

ASEPSIS IN MIDWIFERY.

Importance of Asepsis in Midwifery—Mechanism by which the Uterus is kept Aseptic during Pregnancy and Labour—The Vaginal Secretion—The Operculum—Method of Sterilising the Hands and the Instruments—Prophylactic Douching—Douching Solutions—Preparation of Patient for an Obstetrical Operation.

It is not an exaggeration to say that the most essential knowledge in midwifery is the knowledge of asepsis. A practititioner who knows nothing of the science and art of midwifery, except that it is absolutely necessary that his hands and instruments are sterile, will save more lives than the most accomplished obstetrician who does not practise asepsis. It is therefore most fitting that the first chapter of this little book should deal with the practice of asepsis in midwifery.

If there were no such things as vaginal examinations, or as intra-vaginal or intra-uterine operations, a previously healthy patient, confined under proper hygienic circumstances, would never suffer from acute sepsis. This being so, there must be some natural mechanism which guards against the entrance of pyogenic organisms into the uterus. At the commencement of labour a healthy vagina is lubricated with a fluid, which is composed partly of the secretion of the cervical glands, and partly of serous transudation from the vaginal blood-vessels. This fluid is swarming with bacteria, which not only are not pyogenic, but are a direct bar to the entrance of pyogenic bacteria (Döderlein). This they effect by the formation of lactic acid, which renders the vaginal discharge acid, and so prevents the development of pyogenic organisms, as the latter can only exist in an alkaline medium. Their antiseptic effect is further assisted by phagocytic action and by the absence of oxygen in the vagina. It has been found by experiment, that pyogenic organisms introduced into the vagina are destroyed in a few hours.

In addition to the protection furnished by the vaginal discharge, there is a further bar to the entrance of bacteria into the uterus; this is the plug of mucus which fills the cervix, the so-called *operculum*. This plug is described as consisting of three layers, an upper or uterine layer, a middle or cervical layer, and a lower or vaginal layer. The upper layer contains no bacteria of any kind, hence it is aseptic. The middle layer contains dead bacteria and quantities of white corpuscles. These latter act as phagocytes, and hence the middle layer

is antiseptic. The lower layer contains swarms of bacteria,—non-pathogenic if the vagina is healthy, and pathogenic if there is any form of vaginitis present; it therefore may be septic. It is said that no bacteria can find their way past the middle layer of the operculum except gonococci. Thus, by the aid of the vaginal bacteria and of the operculum, the uterus is kept aseptic before delivery.

After the birth of the child, all bacteria have disappeared from the vagina. This is brought about in the following manner :—When the membranes rupture, the flow of liquor amnii through the vagina washes away the greater number of micro-organisms. Then, the presenting part of the child, as it passes through the vagina, distends its walls to the utmost, so that the second rush of liquor amnii, and after it the placenta, are enabled to wash away all that remain. Thus the uterus is prevented from becoming infected after delivery, the time at which it is exposed to the greatest risks.

If vaginal examinations have to be made, or operations performed, these natural methods of protection are insufficient, and consequently, in such cases, it is incumbent on us to do everything in our power to avoid the introduction of bacteria. They may be introduced in three ways :—

(1) By septic hands.
(2) By septic instruments.
(3) By carrying up septic matter from the vulva or vagina on our fingers or instruments into the uterus.

(1) To avoid the first, the hands must be cleansed thoroughly. The following is a satisfactory method

of disinfecting the hands, it possesses the advantage of not requiring the use of several different kinds of antiseptics, and it has stood the test of time at the Rotunda Hospital and in many other places. It is carried out as follows:—Cut the nails short, and remove gently with a penknife any superfluous skin which may surround them. Wash the hands with any good soap—carbolic, if wished—and a nail-brush for from three to five minutes, in plain water or in a one per cent. solution of lysol. Special attention must be paid to the nails and the skin surrounding them. Wash off all trace of soap from the hands, and then immerse them for one minute in a 1 in 500 solution of corrosive sublimate in water. If the obstetrician does not like corrosive sublimate, he can substitute for it mercuric potassium iodide, a substance which has the advantage over corrosive sublimate that it does not cause blackening of the finger-nails. It is also said to be more powerful and at the same time to possess less toxic effects, and so to be less dangerous. It possesses the properties of the red iodide of mercury, but is considerably more soluble. It is used at a strength of 1 in 1000. If the hands have been in contact with pus or other septic material, a more rigorous method of disinfection should be adopted, such as the following:—Scrub the hands for five minutes in warm water with soap and a nail-brush. Then scrub them for from three to five minutes in absolute alcohol, and finally soak them in an antiseptic such as corrosive sublimate. Avoid the use of lubricants, if possible. If one must be used, let it be thoroughly aseptic. Carbolised vaseline is never safe, particularly when kept in a box into

which dirty fingers are introduced from time to time. Soap, which has been boiled in the making, furnishes an excellent and safe lubricant. It requires one precaution, viz., that the outer layer be first washed off, and thus any dirt which was in contact with it removed. The inner layer is aseptic.

In addition to the thorough disinfection of the hands, the routine use of rubber gloves is advisable. Even with the most careful and prolonged washing, it is impossible to *sterilise* the hands, whilst rubber gloves which have been previously boiled are always sterile. We therefore strongly advise their use in all cases. At first, they may cause a little awkwardness by blunting the sense of touch, but this is only an initial difficulty, and is quickly overcome. Their use is especially necessary in the case of the general practitioner, who cannot keep his hands as free from contact with septic matter as can the specialist, but even in the case of the latter they are always indicated.

(2) To avoid the second method of infection, instruments must be, as far as possible, of metal, to enable them to be boiled. This should be done for at least five minutes. If a one per cent. solution of common washing soda is used, the instruments will not become rusty.

(3) To avoid the third method of introducing infection, the vulva must be thoroughly washed and disinfected by the nurse before any examination is made. If an operation has to be performed, which necessitates the introduction of fingers or of instruments into the uterus, the vagina must be disinfected as well. This is done because, in many cases, the

vaginal discharge is not normal; and also because bacteria, which may be non-pathogenic in the vagina, may become pathogenic by feeding upon dead tissue, blood-clots, etc., in the uterus. To disinfect the vagina, it must be thoroughly douched with a solution of creolin, scrubbed all round with the fingers and a small piece of soap, and then douched again.

A few words must be said on the subject of routine prophylactic douching, *i. e.* douching before and after labour with a view to preventing sepsis, a practice which is recommended by many obstetricians. Before adopting a general principle of treatment which is obviously not dictated by nature, it is well to ask certain questions. Is the particular practice which we are about to adopt necessary or unnecessary, free from danger or dangerous? If it is proved to be necessary in some cases, is it so in all cases? If it is not so in all cases, can we formulate rules which will govern its use in the particular case in which it is required?

Douching, like vaginal examinations, can never be wholly free from danger, hence its use must be entirely controlled by the necessity for it. Assuming the truth of Döderlein's investigations into the condition of the vagina during labour, routine ante- or post-partum douching is obviously not necessary in cases in which the genital tract is in a healthy condition, and in which no intra-uterine manipulations have to be performed. It is equally obvious that, in cases of putrefaction or suppuration in or near any part of the genital tract, douching is advisable, provided we do not carry infection from one part of the tract to another in our endeavour to remove it. Following

this line of reasoning, we find that ante-partum douching is indicated—

(1) If any operation is about to be performed.

(2) If there is any purulent or putrid discharge from the vagina or the uterus.

(3) If the patient is a very long time in the second stage of labour. In these cases, the liquor amnii drains away slowly, and, by the time the head is born, there is not sufficient left to wash out the vagina. Also, during the protracted labour, some of the liquor amnii may lie in the vagina and decompose.

Prophylactic post-partum uterine or vaginal douching is a practice which must be even more strongly condemned than ante-partum douching. Inasmuch as it has been proved that the vagina is free from bacteria after delivery, it is quite unnecessary. In addition, when the douche is administered as a routine practice by an ignorant nurse, with a much-used Higginson's syringe, and at a time when the absorption of septic organisms is so easy, it is extremely dangerous. Like ante-partum douching, a post-partum uterine or vaginal douche is indicated under certain conditions, and must then be regarded as a serious operation, and must be performed with the strictest attention to asepsis. If possible, it should be administered by the medical attendant himself. Accordingly, prophylactic post-partum douching is indicated under the following conditions:—

(1) If the hand has been introduced into the uterus, *e. g.* for the removal of a placenta.

(2) If the fœtus, placenta, or liquor amnii is putrid.

(3) If there is a purulent discharge from the uterus.

(4) If the lochia becomes putrid at any time during the puerperium.

For the purpose of douching, creolin and water, of a strength of half an ounce of the former to a gallon of the latter, or a one per cent. solution of lysol, is best. A douche should be administered at a temperature of 100° F. (38° C.) in ordinary cases, but to check hæmorrhage the temperature may reach 120° F. (49° C.). Corrosive sublimate is almost useless for the purpose of douching, and should never be used. Before labour, it corrugates the tissues and makes them rigid, so that lacerations are very liable to occur. After delivery, if used too strong, or if any is left behind, it may cause symptoms of mercurial poisoning. Douches do not destroy bacteria in the vagina and uterus by means of the antiseptic in the douche, as the fluid does not remain in contact with them for a sufficient length of time. Bacteria are removed mechanically by the flow of fluid, whilst the antiseptic merely helps to render the water in the douche aseptic. Coal-tar derivatives, as creolin and carbolic acid, are said in addition to cause a leucocytosis, so increasing phagocytosis.

We should, therefore, begin every obstetrical operation, in which either hands or instruments have to be introduced into the uterus, in the following manner:—

(1) Wash the external genitals and the skin round them thoroughly with soap and water.

(2) Douche out the vagina thoroughly with creolin or lysol solution, then scrub its walls with the fingers and a clean piece of soap, and then douche it out again.

CHAPTER II.

THE BONY PELVIS.

The Bony Pelvis—The Diameters of the Pelvis—The Inclined Planes.

The bony pelvis is formed by four bones—the two innominate bones, the sacrum, and the coccyx (*v.* Fig. 1). These articulate in the following manner:—Each innominate bone articulates with the sacrum at the sacro-iliac joint, and with its fellow at the pubes. The sacrum articulates with the last lumbar vertebra, with the two innominate bones at the sacro-iliac joints, and with the coccyx at the sacro-coccygeal joint. The coccyx articulates with the sacrum alone. The joints are usually rigid, but towards the end of pregnancy their ligaments soften, and so permit slight movements to take place. The sacrum rotates antero-posteriorly, as if it was pivoted upon the sacro-iliac joints. As the fœtal head descends, it presses upon the promontory of the sacrum and forces this slightly backwards. As soon as the head has passed the brim, the promontory returns to its original position, and then moves slightly forwards, as the descending head drives the lower pieces of the

sacrum backwards. The coccyx can also move backwards on the sacro-coccygeal joint, and thus increase the antero-posterior diameter of the outlet by about three-quarters of an inch. The pubic bones can separate slightly at the symphysis.

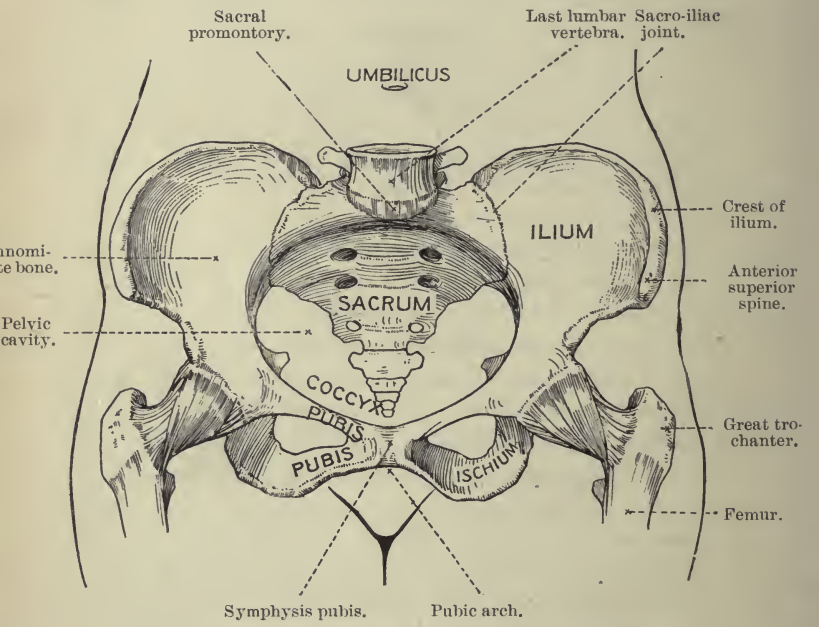


Fig. 1.—The adult female pelvis, seen from in front.

The true pelvis possesses certain diameters which are of great importance. These are the diameters of the brim and the diameters of the outlet. The brim has four chief diameters, and by their measurement we can ascertain its shape and size (*v.* Fig. 2). They are :—

(1) *The antero-posterior diameter* (*conjugata vera*), *i. e.* the distance between the promonotory of the sacrum and the most prominent part of the inner surface of the symphysis pubis. It measures normally from 4 to $4\frac{1}{4}$ inches (10—10·5 cm.).

(2) *The transverse diameter, i. e.* the greatest dis-

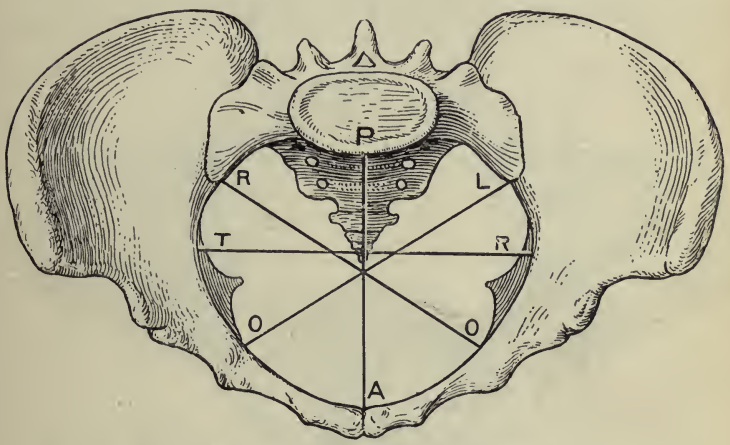


Fig. 2.—The female pelvis, seen perpendicularly to the axis of the brim. A, P. True conjugate diameter. T, R. Transverse diameter. O, R. Right oblique diameter. O, L. Left oblique diameter.

tance between the lateral margins of the brim. It measures $5\frac{1}{4}$ inches (13 cm.).

(3 and 4) *Two oblique diameters,* right and left, *i. e.* the distance between the sacro-iliac joint on one side and the pectineal eminence on the opposite side. The right oblique diameter runs from the right sacro-iliac joint to the left pectineal eminence; the left oblique diameter runs from the left sacro-iliac joint

to the right pectineal eminence. They each measure about 5 inches (12·5 cm.).

The outlet has two chief diameters (*v.* Fig. 3) :—

(1) *The antero-posterior diameter, i.e.* the distance from the tip of the coccyx to the lower border of the symphysis. It measures $3\frac{4}{5}$ inches (9·5 cm.), and can be increased by three-quarters of an inch by the backward movement of the tip of the coccyx.

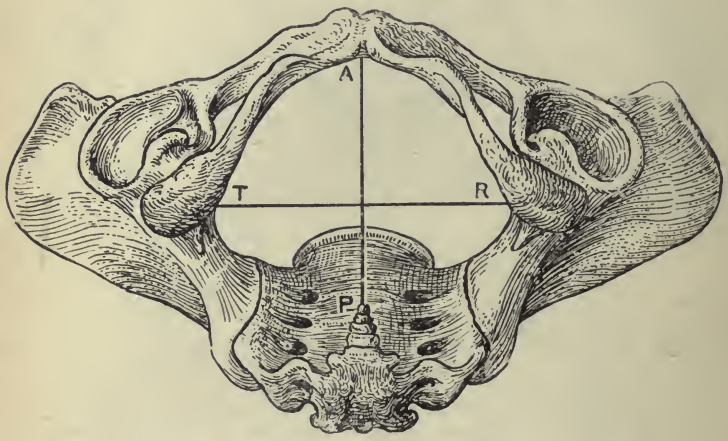


Fig. 3.—Outlet of pelvis. A, P. Antero-posterior diameter. T, R. Transverse diameter.

(2) *The transverse, i. e.* the distance between the tuberosities of the ischii. It measures $4\frac{2}{5}$ inches (11 cm.).

It is also well to know the measurement of the pelvic cavity,—first, in its plane of greatest expansion; and secondly, in its plane of greatest contraction (*v.* Fig. 4). *The plane of greatest expansion* passes through the middle of the symphysis and the junc-

tion of the second and third pieces of the sacrum. *The plane of greatest contraction* passes through the lower margin of the symphysis and the lower margin of the last piece of the sacrum. For the sake of

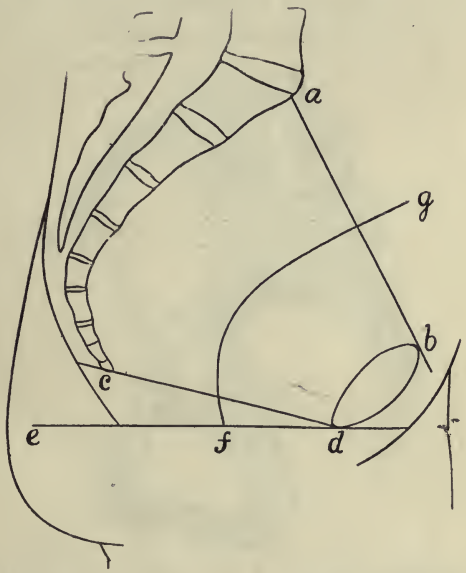


Fig. 4.—Median outline section of a female pelvis. *a, b.* Line of inclination of the brim of the true pelvis. *c d.* Line of inclination of the outlet of the true pelvis. *g, f.* Axis of the pelvic canal. *e, d.* Horizontal line through lower margin of symphysis.

convenience, a table is appended of the diameters of the pelvis in these various planes :—

	Antero-posterior Diameter. In. (Cm.	Transverse. In. (Cm.)	Oblique. In. (Cm.)
Plane of pelvic inlet	4-4¼ (10–10·5)	5¼ (13)	5 (12 5)
„ greatest expansion	5⅕ (13)	4¾ (12)	
„ greatest contraction	4 (10)	4 (10)	
„ pelvic outlet	3⅘ + ¾ (9·5 + 2)	4⅖ (11)	

The inclined planes of the pelvis, which concern the obstetrician, are two in number. They start one at each side in front of the ischiatic spines, and slope downwards and forwards over the ischium (*v.* Fig. 5). They are so placed that the part of the child, which first impinges on either of them, is

Fig. 5.—Median section of a female pelvis. 1. Symphysis pubis. 2. Promontory of the sacrum. 3. Coccyx. 4. Anterior superior spine of ilium. 5. Tuberosity of ischium. 6. Spine of ischium. The vertical and horizontal lines help to show the normal inclination of the pelvis when the woman is in the erect posture. (Reduced one-third from *Naegele.*)

directed downwards and forwards, and consequently they are a factor in the causation of internal rotation.

There are other measurements of the pelvis which are of importance. They are as follows :—

	Inches.	Cm.
The distance between the anterior superior spines .	= 10	(25)
„ „ iliac crests . . .	= $11\frac{2}{5}$	(28·5)

	Inches.	Cm.
The height of the posterior wall of the pelvis . .	= $5\frac{1}{5}$	(13)
„ anterior „ „ . .	= $1\frac{3}{5}$	(4)
The external conjugate, *i. e.* the distance between the depression below the last lumbar spine and the upper margin of the symphysis . .	= 8	(20)
The inter-trochanteric distance, *i.e.* the distance between the summits of the great trochanters .	= $12\frac{1}{2}$	(31)
The distance between the posterior superior spines .	= $3\frac{1}{2}$	(9)

CHAPTER III.

THE OVUM.

Constitution of the Ovum: Placenta; Chorion; Amnion; Umbilical Cord; Liquor Amnii; Fœtus, Sizes of at different months, Fœtal Skull, Fœtal Circulation, Attitude of Fœtus, Presentation, Position.

The full-term ovum is composed of the following parts:—

I. Placenta.
II. Chorion.
III. Amnion.
IV. Umbilical cord.
V. Liquor amnii.
VI. Fœtus.

The Placenta.

The placenta is the structure by means of which the fœtus receives its nutriment and supply of oxygen. It is composed of two parts:—one, a fœtal part, formed by the chorion and its villi; the other, a maternal part, formed from the decidua serotina. At full term, it is a circular, disc-shaped mass, weighing about a pound (454 grm.), thickest at the centre, where it is about an inch and a quarter

PLATE II.

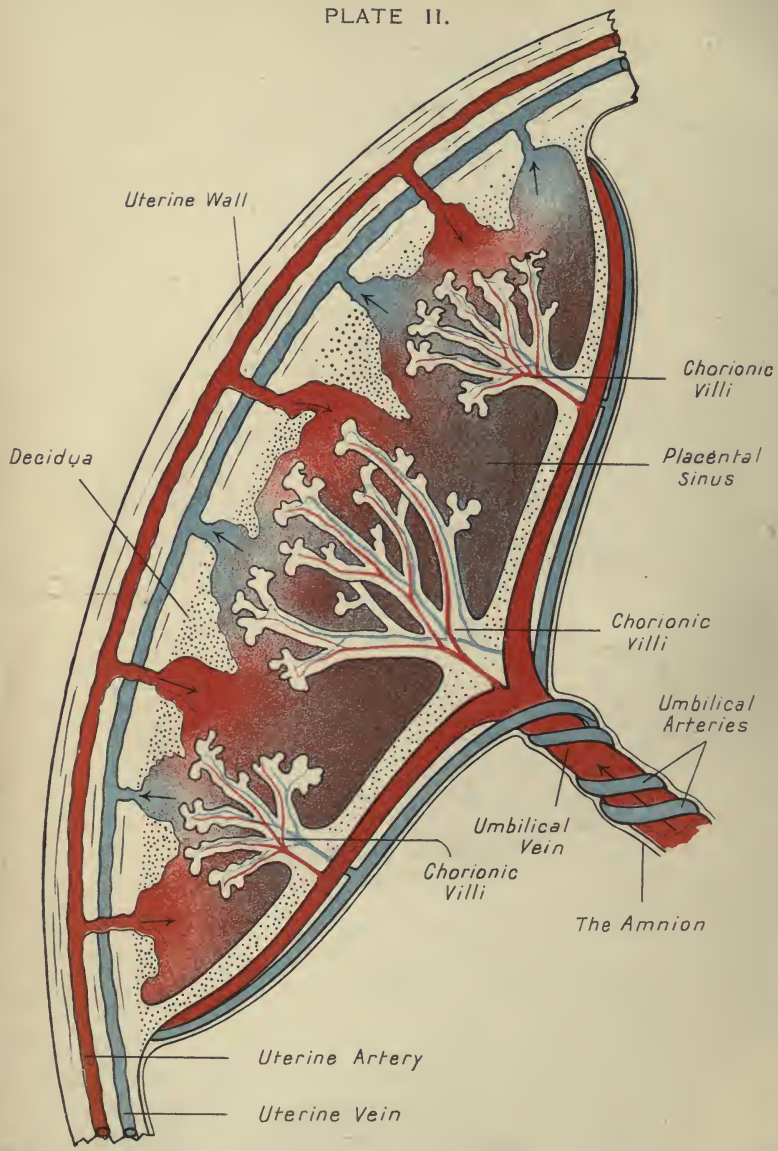


Diagram to show the nature of the Placenta and of its connection to the Uterine Wall.

in thickness, and thinning away towards the edges, which are continuous with the thinned-out and coalesced decidua and chorion. The fœtal surface is smooth and concave, and is closely covered by the

Fig. 6.—The placenta, fœtal surface. A. Chorion. B. Placenta.

amnion, under which run the large branches of the umbilical vessels before they dip into the substance of the placenta. The umbilical cord passes off near the centre. The uterine surface of the placenta is incorporated with the uterine wall, from which it becomes detached at parturition by separating

through the spongy tissue of which the deeper part of the decidua is formed. From without inwards the placenta is composed of the following parts :—

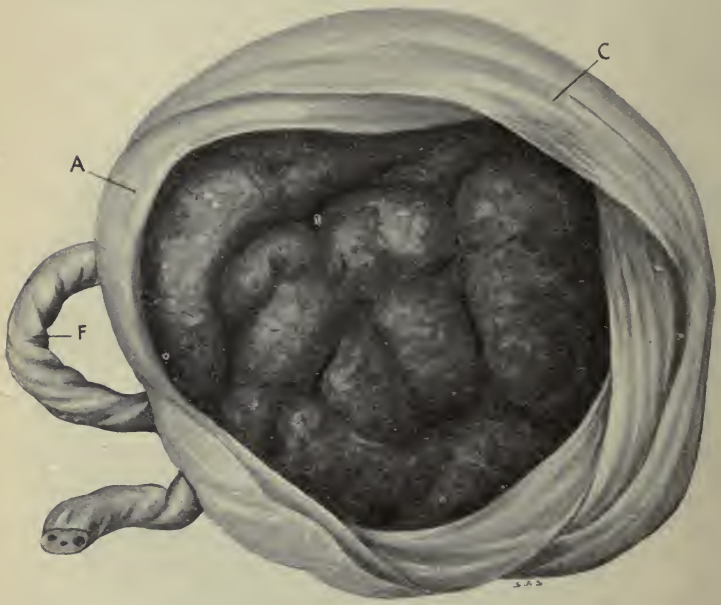


Fig. 7.—The placenta, uterine surface. A. Amnion. C. Chorion. F. Umbilical cord.

(1) A basal layer lying next to the spongy layer of the decidua serotina.

(2) A series of intercommunicating vascular sinuses, which constitute large flattened spaces (the intervillous spaces), bounded towards the uterine wall by the basal layer, and externally by the chorion or perhaps by a thin layer of decidua—the

subchorionic membrane of Turner. These sinuses are supplied directly with arterial blood from the branches of the uterine artery, which pass through the spongy stratum of the decidua serotina and through the basal stratum of the placenta to open into them without the intervention of capillaries. The fœtal villi are accordingly lying in maternal arterial blood, the circulation of which is rendered slow by the oblique manner in which the veins run.

(3) Partitions of fibrous decidual tissue running from the basal layer towards the chorion, and serving to subdivide the labyrinth of vascular spaces or sinuses into a number of loculi (cotyledons). These three sets of structures—(1), (2), (3)—constitute all that remains of the compact layer of the decidua serotina (*v.* page 88).

(4) A layer of chorion and its villi. The villi hang into the loculi, which have been just described, as arborescent tufts continuous with the chorion. They are composed of three different elements. The first of these is a covering of epithelium which is derived from the original fœtal epiblast, and which consists of two layers. The outer layer is composed of multinucleated protoplasm, which has not been differentiated into cells, and is known as the syncytium. The deeper layer is composed of large and well-defined cells with oval nuclei, and is known as Langhans' layer. The second element of the villus is the connective tissue, which forms the main mass of the villus, and is derived from the fœtal mesoblast. The third element consists of blood-vessels. These are the terminal branches of the umbilical vessels, and form capillary

loops at the extremity of the villus. In its passage through these loops, the fœtal blood comes into the most intimate relation with the maternal blood in the uterine sinuses, from which, however, it is still separated by capillary walls, the connective tissue of the villus, and the epithelial layers already mentioned. Some of the villi are attached by firm bands to the basal layer; others are attached by thinner bands to one another, and to the septal prolongations of the decidua; while still others hang free in the loculi.

(5) A layer of amnion. This forms the smooth internal covering of the placenta.

The functions of the placenta are threefold. It serves as the respiratory organ of the fœtus which through it receives the necessary supply of oxygen. It serves as an organ of nutrition, by means of which nutriment passes from the maternal to the fœtal blood. And it serves as an excretory organ, by means of which the fœtus gets rid of the waste products of tissue change. During the later period of intra-uterine life the last function is probably to some extent assisted by the action of the fœtal kidneys. In the selection of nutriment and in the elimination of effete matter, the cells which cover the chorionic villi play, in all probability, an important part.

The Chorion.

The chorion is the term applied to the outermost covering of the ovum, or, if the decidua is considered to be one of the fœtal membranes, to the intermediate

covering. From it spring the villi which grow into the uterine mucous membrane, and, consequently, upon it the fœtus depends for nutriment from the time the villi receive the fœtal vessels through the intermediary of the allantois—that is from about the fourth week—to the time of its expulsion. At first, the chorion is formed by the fusion of the false amnion and the thinned-out remnant of the zona pellucida. As the allantois grows, it carries with it a vascular mesoblastic covering along up to the hitherto non-vascular chorion, and this layer spreads over the chorion and converts it into a highly vascular membrane. The vessels spread into the villi which have already grown into the decidua, and, as a result, free interchange is able to take place, over the entire ovum, between the fœtal and maternal vascular systems. This condition continues until the end of the third month. Then the villi commence to atrophy everywhere, save in the region of the decidua serotina, and have completely disappeared by the end of the fourth month, the villi which persist at the site of the newly formed placenta alone forming a vascular bond of union between the fœtus and the mother.

The Amnion.

The amnion is the term applied to the smooth innermost membrane which invests the fœtus. It is formed from folds of somatopleure, which at an early stage are reflected from the head and tail ends of the embryo. As the embryo sinks into the yolk, these folds grow up over its back, until they

meet and coalesce with one another in the middle line in such a manner as to form two distinct membranes. The inner of these constitutes the true amnion ; while the outer, the false amnion, helps to form the chorion, as has been already mentioned.

The Umbilical Cord.

The umbilical cord, or funis, forms the connection

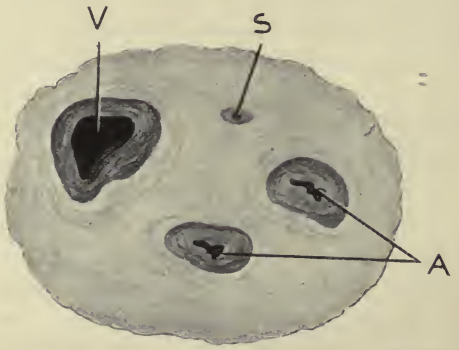


Fig. 8.—Cross-section of umbilical cord. V. Umbilical vein. A. Umbilical arteries. S. Remains of vitelline duct. (× 3.)

between the fœtus and the placenta. It extends from the umbilicus of the fœtus to the centre of the placenta, and carries the vessels which bring fœtal blood to and from the placenta. These vessels are three in number:—two umbilical arteries which convey de-oxygenated blood from the fœtus to the placenta, and one umbilical vein which conveys re-oxygenated blood from the placenta to the fœtus. The vessels are surrounded by a myxomatous form of connective tissue, which is known as

PLATE III.

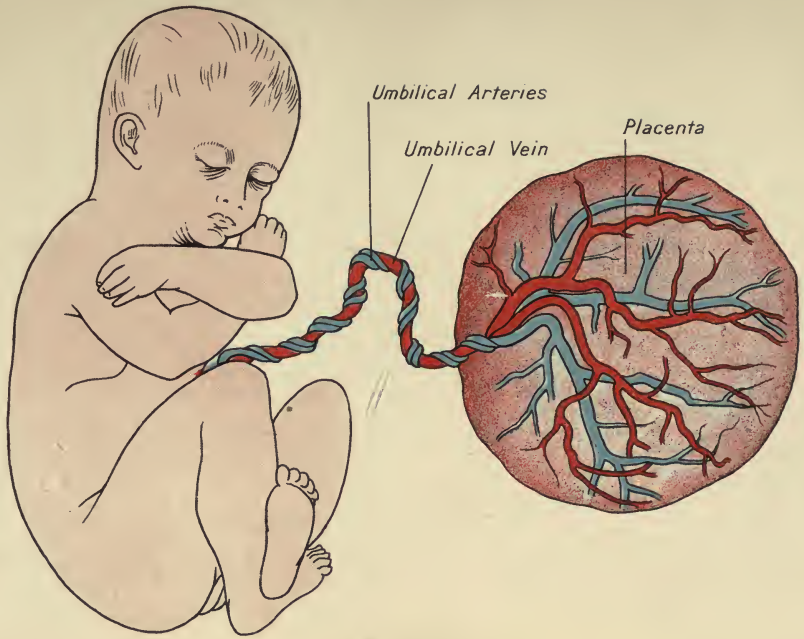


Diagram of the Fœtus, the Placenta, and the Umbilical Cord.

the Whartonian jelly, and the entire cord is invested by a covering of amnion. There are also found in the cord the remains of the allantois and of the vitelline duct. The average length of the cord is about twenty-two inches (56 cm.), but it has been found to vary between six and sixty-four inches (15—163 cm.) Its thickness is about that of the index finger. As a rule, the cord has a spiral twist of a varying number of turns, and in the large proportion of cases the twist is from right to left. The course of the umbilical vessels in the placenta has been described (*v.* page 19) ; their course inside the body of the fœtus will be described later (*v.* page 36).

The Liquor Amnii.

The liquor amnii is the fluid which fills the amniotic sac. Its normal quantity is from two to four pints (1136—2272 c.cs.), but as much as twenty pints (11,359 c.cs.) have been recorded. It is formed principally by transudation from the vessels of the mother, also by the excretion of the fœtal skin and kidneys, and by transudation from the placenta and the umbilical cord.

The liquor amnii has a specific gravity of 1004 to 1025. It contains salts of potassium, sodium, calcium, magnesium, and ammonium, some albumen, and in the later months of pregnancy a small quantity of urea. The presence of the last points to the excretion of urine by the fœtus.

The liquor amnii serves to prevent undue pressure upon the fœtus and umbilical cord, not only during

pregnancy but also during the first stage of labour; to separate the folds of the amnion and so prevent their adhering to one another, or to the fœtus; and, during labour, to dilate the cervix and to wash out the vagina.

The Fœtus.

It is of importance to know the rate of growth and the chief characteristics of the fœtus at the different months of pregnancy, and, consequently, a short note of them will be given here. For all details the student must refer to a work on embryology.

First month.—Two of the earliest ova so far described, and whose age was considered to be between eight and twelve days, had the following characteristics:—The diameter of the earlier one was one-eighth of an inch (3 mm.), of the older three-eighths (9·5 mm.); and the length of the embryos was about one-twelfth of an inch (2 mm.). During this period, the embryo is said to be nourished by osmosis. At the end of the fourth week, the ovum is almost the size of a pigeon's egg, and the length of the embryo is about one third of an inch (8·5 mm.). From the second week on, the nourishment contained in the umbilical vesicle is absorbed by means of the omphalo-mesenteric vessels. At the same time, the allantois is in process of making its way, with the fœtal vessels, towards the chorion.

Second month.—At the end of the second month the ovum is about the size of a hen's egg, that is about two and a half inches in diameter. The embryo is about one and a quarter inches (3 cm.)

in length, and 240 grains (15·5 grm.) in weight. The umbilical vesicle has almost completely atrophied, and, as the allantoic vessels have reached the chorionic villi, the embryo obtains its nourishment through them. The villi, which are subsequently to form the placenta, have commenced to proliferate. Points of ossification have appeared in the clavicle and lower jaw.

Third Month.—At the end of the third month, the ovum is about the size of an orange, that is three and

Fig. 9.—The ovum at the eighth week.

a half to four inches (8·5—10 cm.) in diameter, while the embryo has reached a length of three to three and a half inches (7·5—8·5 cm.) and weighs about three ounces (85 grm). The placenta is almost completely formed, and the remainder of the chorion has lost almost all its villi. The sexual organs have appeared but are not distinguishable. An appearance of nails can be detected. Points of ossification can be found in most of the bones.

Fourth month.—At the end of the fourth month, the fœtus, as it is now termed, is about five inches (12·5 cm.) in length, and seven and a half ounces

(212·5 grm.) in weight. The chorionic villi have entirely disappeared, save in the placenta. The sexual organs are quite distinct, and the formation of *lanugo* or down has commenced.

Fifth month.—At the end of the fifth month, the fœtus is about ten inches (25·5 cm.) in length, and weighs about a pound (454 grm.). Hair is commencing to appear on the head, and the body is

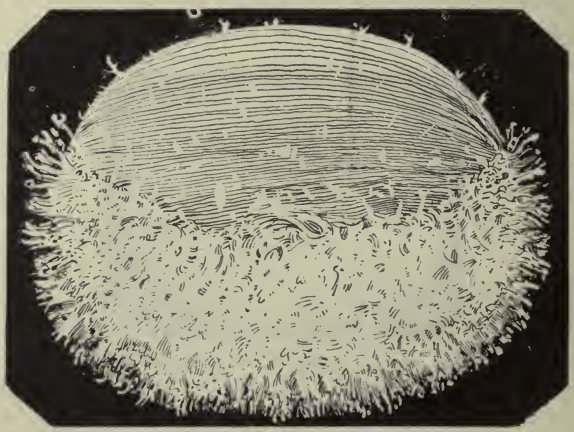


Fig. 10.—The ovum at the twelfth week.

covered by lanugo. The vernix caseosa—a white greasy substance which covers the skin of the fœtus —has appeared. It is composed of desquamated epithelial scales and the secretion of the sebaceous glands. Traces of meconium appear in the intestines.

Sixth month.—At the end of the sixth month, the fœtus is about a foot (30·5 cm.) in length, and weighs from two to two and a half pounds (907—1134 grm.). The eyebrows and eyelashes are com-

mencing to form. The skin is still wrinkled, but a slight deposit of subcutaneous fat is present.

Seventh month.—At the end of the seventh month, the fœtus is about fourteen inches (35·6 cm.) in length, and weighs about three pounds (1361 grm.). The pupillary membrane is still very apparent, and, in a male fœtus, the testes have reached the inguinal canals. When born, the child gives a feeble cry. After this period, *i.e.*, after the twenty-eighth week, it is considered to be viable, *i.e.*, capable of being reared.

Eight month.—At the end of the eighth month, the fœtus is sixteen to seventeen inches (43—45·5 cm.) in length, and weighs from four to four and a half pounds (1814—2040 grm.). There is an increased subcutaneous deposit of fat, and consequently the wrinkled appearance of the skin has almost disappeared. The pupillary membrane is disappearing and so is the lanugo.

Ninth month.—At the end of the ninth month, the fœtus is about eighteen inches (45·5 cm.) in length, and weighs from four and a half to five pounds (2040—2268 grm.). The previous bright red colour of the skin has somewhat subsided. The nails have not quite reached to the ends of the fingers.

Tenth month—Full term.—At full term, the fœtus is about twenty inches (51 cm.) in length, and its weight is about seven pounds (3175 grm.). The finger-nails reach beyond the ends of the fingers, the toe-nails to the ends of the toes, and the hair of the head is one or two inches in length. The lanugo has disappeared, save perhaps on the

shoulders. The child cries vigorously, and moves its limbs strongly. In male infants both testicles are in the scrotum, in female the labia majora cover the labia minora. Within a few hours, the child passes urine and meconium. The latter is a dark green or almost black and slimy substance, com-

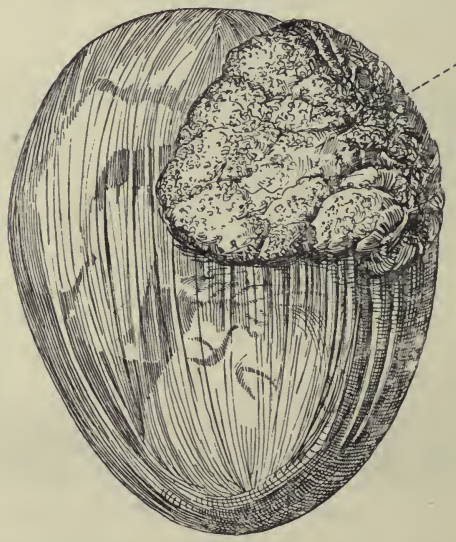


Fig. 11.—The full-term ovum, as it would appear if it was removed entire from the uterus without rupturing the membranes.

posed of mucus from the intestines mixed with lanugo, epithelium, and bile. It owes its colour to the presence of the bile.

The Fœtal Skull.—The fœtal skull is composed of two parts—the cranium and the face. The cranium constitutes the larger portion of the skull, and, from

an obstetrical point of view, is the more important. It is composed of eight bones, and can be subdivided into a vault and a base. The vault is formed by the lateral halves of the frontal bone, the two parietal bones, the squamous portion of the two temporal bones, and the occipital portion of the occipital bone. Its most important characteristic, from an obstetrical point of view, is that these bones, instead of being more or less rigidly united to one another, are only connected by a membranous union. The result is that the vault of the cranium is essentially compressible—a most important attribute, as we shall presently see. The membranous unions between the various bones are termed *sutures*, and the meeting-place of two or more sutures is termed a *fontanelle*. The base of the skull, on the other hand, is an incompressible structure, whose dimensions cannot be altered by any force, save one which is sufficient to bring about an actual rupture of its parts. It is formed by the following bones—the orbital plates of the frontal and the cribriform plate of the ethmoid, the body and wings of the sphenoid, the petrous portion of the temporal bones, and the condylar and basilar portions of the occipital bone.

The face, owing to its smaller size, is of comparative unimportance. It is composed of fourteen bones, so united to one another that, like the base of the cranium, the structure which they form is incompressible.

Sutures.—The sutures are the intervals between the bones of the cranium. The most important are the lambdoidal, between the occipital and parietal bones; the sagittal, between the parietal bones; the

coronal, between the frontal and the parietal bones; the frontal, between the lateral portions of the frontal bone; and the temporal sutures (two), between the sphenoid and the squamous portion of the temporal bone and the frontal, parietal, and occipital bones.

Fontanelles.—The fontanelles are the angular spaces formed by the intersection of the various sutures. There are two principal fontanelles (*v.* Fig. 13):—

(1) The anterior fontanelle, the large fontanelle, or the bregma, is situated at the junction of the sagittal, coronal, and frontal sutures. It is lozenge-shaped, and four sutures meet to form it.

(2) The posterior fontanelle, or the smaller fontanelle, is situated at the junction of the lambdoidal and sagittal sutures. It is triangular, and three sutures meet to form it.

There are also four accessory fontanelles, two at each side (*v.* Fig. 12):—

(1) and (2) The antero-lateral or temporal fontanelles at the junction of the coronal and temporal sutures.

(3) and (4) The postero-lateral or mastoid fontanelles at the junction of the lambdoidal and temporal sutures.

The anterior and posterior fontanelles can be distinguished, when making a vaginal examination, by comparison of their size and shape, and by the difference in the number of sutures which meet to form them.

Regions.—The skull as seen in profile is divided into the following regions (*v.* Fig. 12):—

(1) The occiput, or hind head, *i. e.* the space

between a point immediately below the occipital prominence and the posterior fontanelle. It is co-terminous with the occipital bone.

(2) The vertex, *i. e.* the space between the anterior and posterior fontanelles, and bounded laterally by the prominence of the parietal bones.

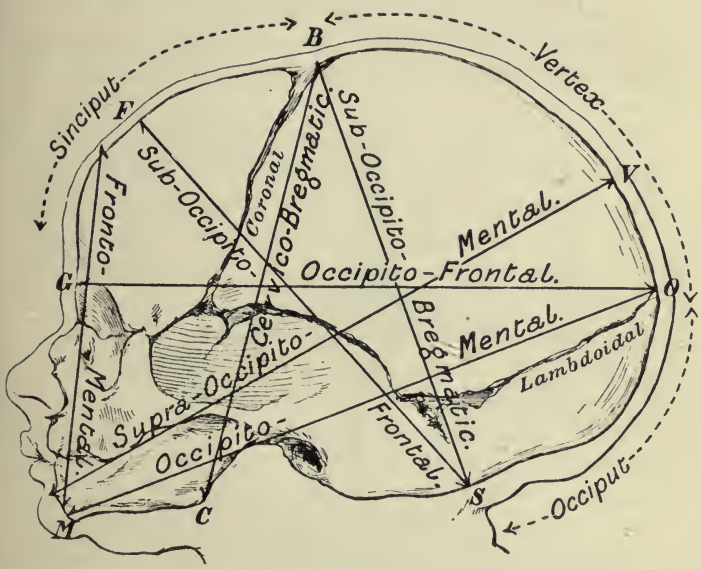


FIG. 12.—Side view of the fœtal skull, showing diameters and regions.

(3) The sinciput, or forehead, *i. e.* the space between the anterior fontanelle and the glabella (the space between the superciliary ridges and immediately above the suture between the frontal bone and the nasal and superior maxillary bones). It is co-terminous with the frontal bone.

(4) The face, *i. e.* the space between the glabella

and the junction of chin and neck. It is bounded laterally by a vertical line drawn immediately in front of the ears.

Diameters.—The diameters of the fœtal skull are imaginary lines drawn through the skull from one fixed point to another, by means of which we are enabled to obtain a definite idea of the size and shape of the head. The various diameters, which are usually taken into consideration, are as follows :—

The sub-occipito-bregmatic diameter is the distance between the bregma, or large fontanelle, and a point immediately below the occipital prominence.

The cervico-bregmatic diameter is the distance between the bregma and a point representing the junction of the neck and chin.

The fronto-mental diameter is the distance between the lowest part of the chin and the highest part of the forehead.

The occipito-mental diameter is the distance between the tip of the chin and the posterior fontanelle.

The supra-occipito-mental diameter is the distance between the chin and the most distant part of the vertex.

The occipito-frontal diameter is the distance between the glabella and the posterior fontanelle.

The sub-occipito-frontal diameter is the distance between the prominence of the forehead and a point just below the occipital prominence.

The bi-parietal diameter is the distance between the parietal eminences.

The bi-temporal diameter is the distance between

the most widely separated points on the coronal suture.

The following are the measurements of the various

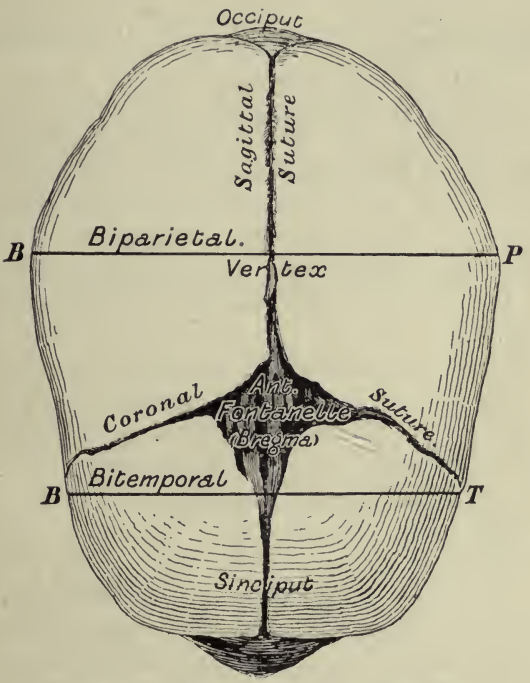


FIG. 13.—The fœtal skull as seen from above.

diameters of the full-term fœtal skull (*v.* Figs. 12 and 13) :—

Sub-occipito-bregmatic diameter	. = $3\frac{3}{4}$	inches	(9·5 cm.).
Cervico-bregmatic „	. = $3\frac{3}{4}$	„	(9·5 „).
Fronto-mental „	. = $3\frac{1}{5}$	„	(8 „).
Occipito-mental „	. = 5	„	(12·5 „).
Supra-occipito-mental (maximum diameter of Budin)	. = $5\frac{1}{2}$	„	(14 „).

Occipito-frontal diameter	. .	= $4\frac{1}{2}$ inches	(11·5 cm.).
Sub-occipito-frontal „	.	= 4 „	(10 „).
Bi-parietal „	. . .	= $3\frac{3}{4}$ „	(9·5 „).
Bi-temporal „	. . .	= $3\frac{1}{5}$ „	(8 „).

Circumferences.—The important circumferences of the head are as follows:—

(1) A sub-occipito-bregmatic circumference measured round the ends of the sub-occipito-bregmatic diameter. It measures $12\frac{4}{5}$ inches, and its maximum diameters are the sub-occipito-bregmatic diameter and the bi-parietal diameter. This is the maximum circumference which has to pass through the brim when the normal degree of flexion of the head is present.

(2) An occipito-frontal circumference measured round the ends of the occipito-frontal diameter. It measures $13\frac{3}{5}$ inches, and its maximum diameters are the occipito-frontal and the bi-parietal. It is the maximum circumference which has to pass through the pelvis when the head is in a position midway between flexion and extension.

(3) A supra-occipito-mental circumference—the maximum circumference of the head—measured round the ends of the supra-occipito-mental diameter. It measures $14\frac{2}{5}$ inches, and its greatest diameters are the supra-occipito-mental diameter and the bi-parietal diameter. It is the maximum circumference which has to pass through the pelvis when the head is semi-extended.

(4) A cervico-bregmatic circumference measured round the ends of the cervico-bregmatic diameter. It measures $12\frac{4}{5}$ inches, and its maximum diameters are the cervico-bregmatic and the bi-parietal

diameters. It is the maximum circumference which has to pass through the pelvis when the head is fully extended.

Just as the diameters of the head can be altered in length by compression, so the circumferences can be similarly affected, and can all be more or less reduced in length. The sub-occipito-bregmatic circumference can perhaps be diminished to the greatest and the cervico-bregmatic circumference to the least extent.

The Fœtal Trunk.—The dimensions of the fœtal trunk are not so important as are those of the skull, as they can be so reduced by compression during labour that normally they do not interfere with the passage of the fœtus. The distance between the tips of the acromion processes of the scapulæ, or the bis-acromial diameter, is the greatest transverse diameter of the trunk, and measures $4\frac{2}{5}$ inches (11 cm.). It can be reduced by pressure to $3\frac{3}{5}$ inches (8·5 cm.). The greatest antero-posterior diameter of the trunk, or the sterno-dorsal diameter, lies between the sternum and the spinal column, and measures $3\frac{4}{5}$ inches (9·5 cm.). It can be reduced by pressure to $3\frac{1}{5}$ inches (8 cm.).

The Fœtal Breech.—The dimensions of the breech are, like those of the trunk, of no very great practical importance. Three diameters are usually described:—

(1) The bi-trochanteric diameter, running between the trochanters and measuring $3\frac{4}{5}$ inches (9·5 cm.), is the largest diameter.

(2) The bis-iliac diameter, running between the most widely separated points on the iliac crests and measuring $3\frac{3}{5}$ inches (9 cm.).

(3) The sacro-iliac or antero-posterior diameter, running between the symphysis and the sacrum, and measuring $2\frac{1}{5}$ inches (5·5 cm.).

The Length of the Fœtus.—The following table shows the average length of the fœtus in centimetres at the end of the different months, and will enable the figures to be more easily remembered. At the end of each month up to the fifth, the length of the fœtus in centimetres is equal to the square of the number of the month. After the fifth month, the length of the fœtus is obtained by multiplying the number of the month by five.

Number of Month.			Length of Fœtus in Centimetres.	
1	1 × 1	=	1	($\frac{2}{5}$ inch).
2	2 × 2	=	4	($1\frac{3}{5}$ inches).
3	3 × 3	=	9	($3\frac{3}{5}$ „).
4	4 × 4	=	16	($6\frac{2}{5}$ „).
5	5 × 5	=	25	(10 „).
6	6 × 5	=	30	(12 „).
7	7 × 5	=	35	(14 „).
8	8 × 5	=	40	(16 „).
9	9 × 5	=	45	(18 „).
10	10 × 5	=	50	(20 „).

(*Haase.*)

The Fœtal Circulation.—Prior to the birth of the fœtus and the establishment of the pulmonary circulation, the course which the blood takes from the fœtal organ of respiration, *i. e.* the placenta, through the fœtus and back to be re-purified is as follows (*v.* Plate I) :—The purified blood leaves the placenta by means of the umbilical vein, and enters the body of the fœtus at the umbilicus. It then divides, at the transverse fissure of the liver, into two streams. The larger stream flows through the ductus venosus

PLATE IV

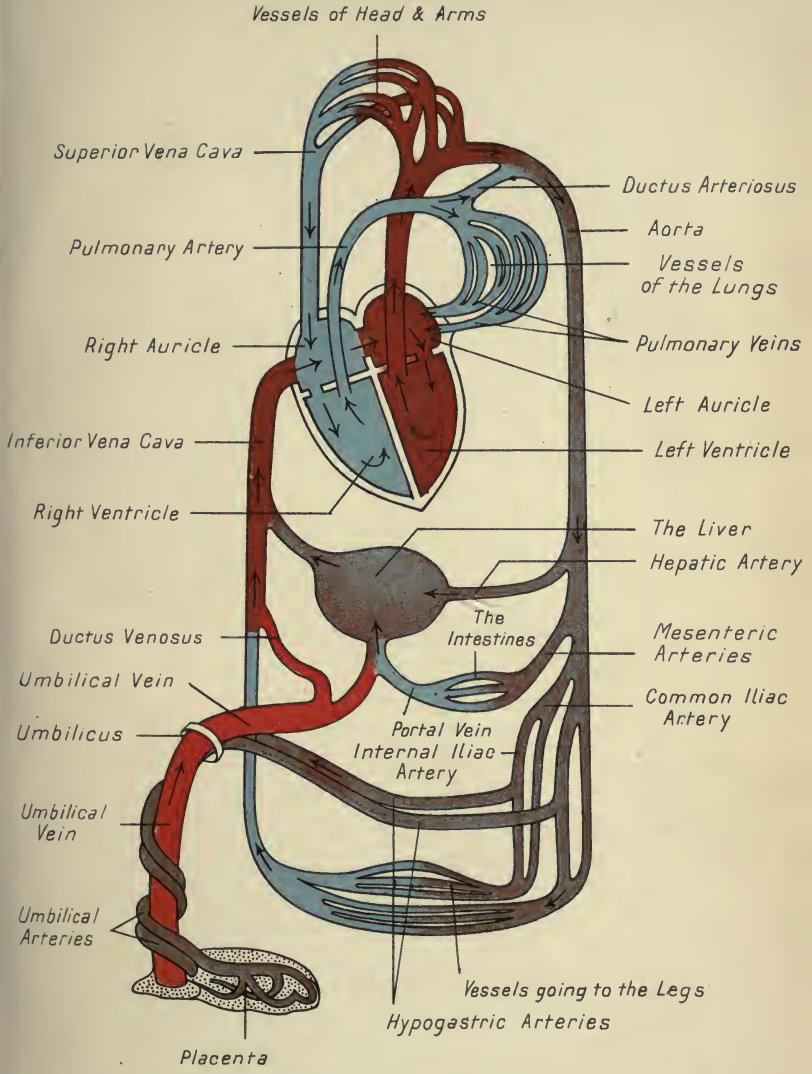


Diagram of the Fœtal Circulation.

into the inferior vena cava, where it meets the impure blood returning from the lower half of the body; the smaller stream flows into the portal vein, thence through the liver, and thence through the hepatic veins, with the addition of the blood which reached the liver through the hepatic artery, also into the inferior vena cava. Accordingly, the inferior vena cava pours into the right auricle, pure blood from the placenta, and impure blood from the liver and lower half of the body.

From the right auricle, this stream is believed to be directed by the Eustachian valve through the foramen ovale into the left auricle, without mingling to any great extent with the impure blood which also enters the right auricle through the superior vena cava. In the left auricle, it is rendered more impure by the addition of the small quantity of blood which returns from the lungs through the pulmonary veins.

From the left auricle, the mixed stream flows into the left ventricle, and thence into the aorta. From the aorta, a small part of the stream flows to the head and arms, to be returned subsequently through the superior vena cava into the right auricle, while the main stream flows into the descending aorta, and there meets the impure blood which is poured into the aorta, from the pulmonary artery, through the ductus arteriosus. Thence, this mixed blood flows to the lower portion of the body, whence it in part returns to the inferior vena cava, either directly or through the intermediary of the liver, and in part flows through the hypogastric arteries to the umbilicus, and thence through the umbilical arteries to the placenta.

The course of the blood which left the arch of the aorta, supplied the head and arms, and returned to the right auricle through the superior vena cava, has still to be followed. In the right auricle, this stream of impure blood receives a slight addition of pure blood. The mixed stream then flows into the right ventricle, and thence into the pulmonary artery. From the pulmonary artery by far the greater part passes, through the ductus arteriosus, into the descending aorta, where it meets the blood from the left ventricle, as has been described. The smaller portion flows through the pulmonary artery to the lungs, whence it returns through the pulmonary veins to the left auricle, to unite with the blood that came into the heart through the inferior vena cava.

At the birth of the child, and the establishment of respiration, modifications occur in the heart and vessels, which result in the establishment of the pulmonary circulation, properly so called (*v.* Plate II). These changes are more immediately determined by the inflation of the lungs with air during the first respiration, by the accompanying rapid increase of blood in the pulmonary blood-vessels, and by the interruption to the passage of blood through the placental circulation. They are finally completed by the obliteration of the ductus arteriosus and the hypogastric arteries, by the cessation of the passage of blood through the foramen ovale, and by the obliteration of the umbilical vein and of the ductus venosus. The lumen of the hypogastric arteries is usually completely obliterated by the third or fourth day after birth; the ductus arteriosus is usually closed

PLATE V.

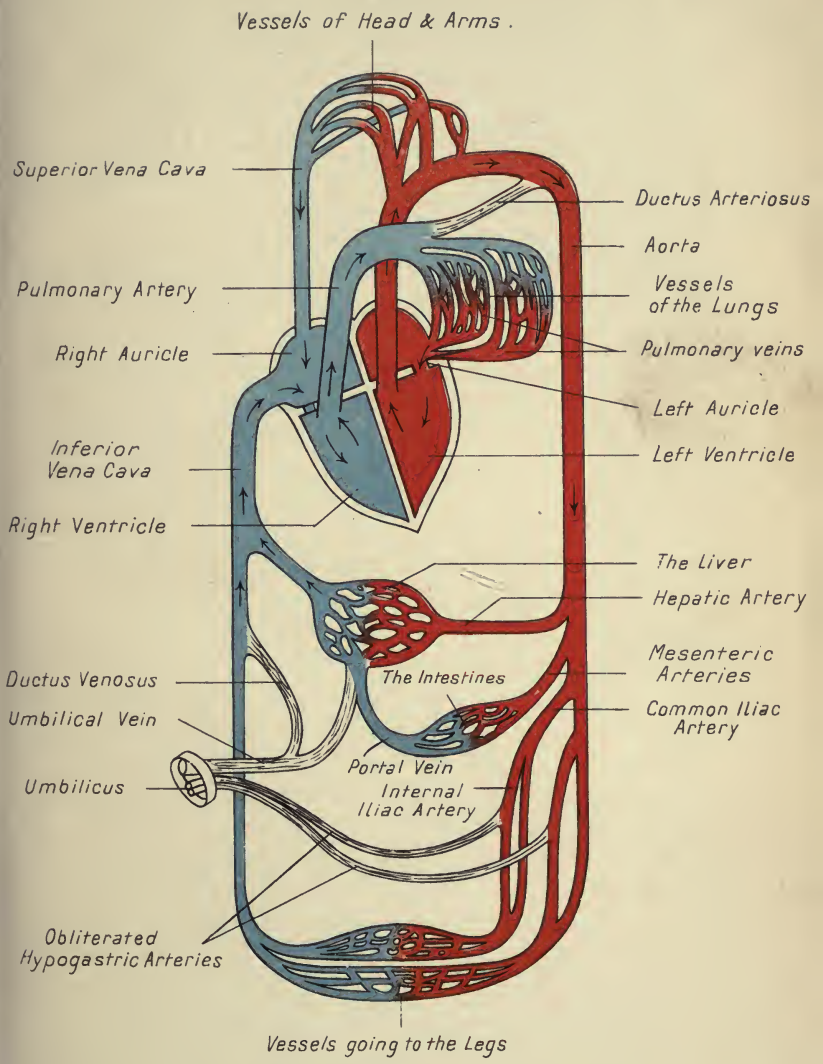


Diagram of the Adult Circulation.

after the eighth or tenth day, and the umbilical vein and ductus venosus by the sixth or seventh day. Although blood ceases to pass through the foramen ovale at the moment of birth, in all probability the opening does not become completely obliterated until some time in the latter half of the first year.

Attitude.—The attitude, or posture, which the fœtus assumes in the uterus is one which reduces it to the smallest possible size. The head is flexed upon the chest, the spine curved with the convexity backwards, the upper limbs crossed on the chest, the thighs flexed on the abdomen, and the legs flexed on the thighs and crossed. The fœtus thus assumes an ovoid shape, having two poles, the pelvic and the cephalic. The pelvic pole, that is the breech and lower extremities, is larger than the cephalic pole; and the distance between the two poles is the longer axis of the ovoid (*v.* Fig. 14).

Presentation.—The presentation is the term applied to that part of the fœtus which is engaged, or is tending to become engaged, in the pelvic cavity. Theoretically almost any part of the fœtal ovoid can present, but as a matter of fact, in a large majority of cases, one or other pole does so. The cephalic pole presents far the more frequently; indeed, counting full-term labours alone, the fœtus is born with the head presenting in about 97 per cent. of cases. The shape of the uterine cavity makes it easy to understand why the child should present by one or other pole; but why there should be such an overwhelming proportion of head presentations is not at first so obvious. Three factors unite to account for it:—

(1) In the earlier months of pregnancy, the uterus grows more rapidly than the fœtus, and, consequently, the latter is free to move about and assume any position. As pregnancy advances, the fœtus grows more rapidly than the uterus ; and, as it commences to occupy the entire uterus, it is guided round by

Fig. 14.—Diagram showing the adaptation of the fœtus to the uterus in a vertex presentation. *(Galabin.)*

the pressure of the uterine walls until its long axis corresponds with the long axis of the uterus,—that is, until the fœtus is lying with one pole at the fundus and the other in the lower uterine segment. Further, since the breech and the lower limbs together are more bulky than the head, and since the uterine cavity is also of an ovoid shape whose

larger end is uppermost, the pelvic pole is guided to the fundus, and the head is guided to the lower uterine segment (Cazeaux). If this is so, we should expect malpresentations in cases in which the uterus has lost its shape, and, as a matter of fact, hydramnios, multiple pregnancies, pluriparous uteri, contracted pelves, uterine tumours, all favour the occurrence of malpresentations by destroying the natural shape of the uterus.

(2) Another factor which may assist in determining cephalic presentations is gravitation. If a fœtus is immersed in a saline solution of the same specific gravity as the liquor amnii, it floats on its back, its head slightly lower than its breech, and its right shoulder lower than its left.

(3) A third factor which may assist in the determining of cephalic presentations, is the active movement of the fœtal lower limbs. These movements meet with greater resistance when the breech lies in the lower portion of the uterus, and, consequently, their tendency is to drive the breech upwards towards the fundus. As soon as this occurs, opposition to the movements is lessened owing to the increased space afforded by the larger end of the uterine cavity, and hence there is no tendency to a further change of presentation.

The various presentations can be classified as follows:—

(A) Cephalic presentations, *i. e.* presentations of the head, occurring in 96·33 per cent. of cases. In this group are included the following:—

(1) Vertex presentation, *i. e.* when the fœtus

assumes its normal attitude and the vertex lies lowest. It occurs in 95·53 per cent. of all deliveries (in this figure, anterior and posterior fontanelle presentations are included).

(2) Face presentation, *i. e.* the resultant presen-

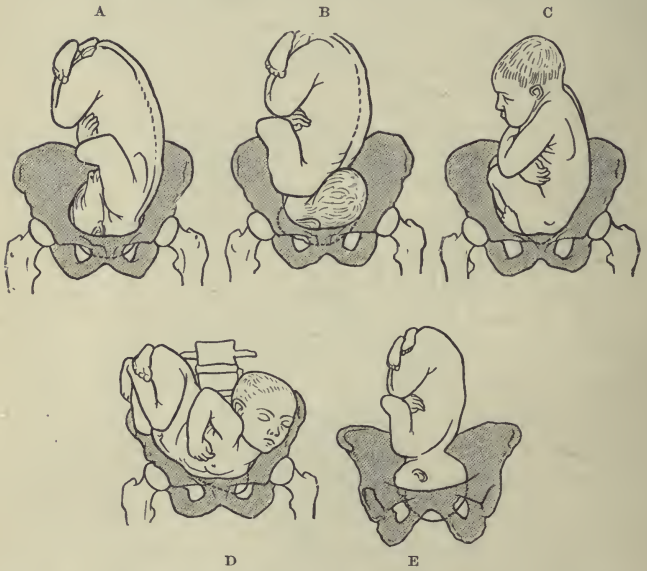


FIG. 15.—Diagram of the principal presentations. A. Vertex. B. Face. C. Pelvic. D. Transverse. E. Brow.

tation after full extension of the head. It occurs in 0·6 per cent. of cases.

(3) Brow presentation, *i. e.* the resultant presentation when the head lies midway between flexion and extension, and the forehead lies lowest. It occurs in 0·2 per cent. of cases.

(4) Anterior fontanelle presentation, *i. e.* a stage

between a vertex and a brow presentation, in which the anterior fontanelle lies lowest.

(5) Posterior fontanelle presentation, *i. e.* the resultant presentation after full flexion of the head, in which the posterior fontanelle lies lowest.

(B) Pelvic presentations, *i. e.* presentations of the breech or lower extremities of the fœtus, occurring in 3·11 per cent. They are divided into—

(1) Complete pelvic presentation, in which the breech and feet descend together.

(2) Incomplete pelvic presentation, in which (*a*) the breech descends alone, (*b*) one or both knees, (*c*) one or both feet descend first.

(C) Transverse presentation, in which some portion of the trunk, usually a shoulder, presents, occurring in 0·56 per cent.

Finally, we may tabulate the presentations and their frequency as follows:—

Vertex presentations (including fontanelle presentations) occur in			95·53	per cent.	of all cases.
Face	„	„	0·60	„	„
Brow	„	„	0·20	„	„
Breech	„	„	3·11	„	„
Transverse	„	„	0·56	„	„

Position.—By position, we mean the relation between some fixed part of the fœtus *in utero* and the middle line of the mother. In polar presentations, *i. e.* cephalic or pelvic presentations, the back is the fixed part chosen, and we recognise four positions, according as it is turned towards the left or the

right side of the mother, and as it is turned forwards or backwards. In transverse presentations, the back is chosen as the fixed part, and we again recognise four positions, according as the back is turned forwards or backwards, and as the head is turned towards the left or the right side of the mother.

In polar presentations, when the back is turned to the left of the middle line and is directed forwards, the fœtus is said to lie in the first position; when the back is turned to the right of the middle line and is directed forwards, in the second position; when the back is turned to the right of the middle line and is directed backwards, in the third position; and when the back is turned to the left of the middle line and is directed backwards, in the fourth position (*v.* Fig. 51).

In transverse presentations, when the back is turned forwards, with the head on the left of the middle line, the fœtus is said to lie in the first position; when the back is turned forwards, with the head on the right of the middle line, in the second position; when the back is turned backwards, with the head on the right of the middle line, in the third position; when the back is turned backwards, with the head on the left of the middle line, in the fourth position (*v.* Fig. 109).

In all polar presentations the first position is the most common. Three factors probably unite to cause this :—

(1) The right oblique diameter of the pelvis is the longer of the two, inasmuch as the left oblique is shortened by the presence of the rectum and the pelvic colon.

(2) The anterior half of the uterine cavity lies lower than the posterior half when the woman is standing, and the uterus tends to fall over slightly to the right side. The lowest part is consequently in the right iliac fossa. As a result, the part of the fœtus which sinks lowest will lie in this region. This, as has been shown, is the head, neck, and right shoulder. Consequently the tendency of gravitation, when the woman is upright, is to keep the head over the pelvic brim, the back in front, and the right shoulder on the right side of the uterus.

(3) The antero-posterior diameters of the fœtal ovoid are longer than the transverse diameters. Further, the transverse diameters of the uterus are longer than the antero-posterior diameters. Owing to the dextro-torsion of the pregnant uterus, its transverse diameters correspond to the right oblique diameter of the pelvis, and, as the fœtus tends to accommodate itself to this long diameter of the uterus, it lies with its antero-posterior diameter in the right oblique diameter of the pelvis.

CHAPTER IV.

OBSTETRICAL DIAGNOSIS.

Methods of Examination: Abdominal Palpation, Vaginal Examination, Auscultation.

The various methods by which we can obtain information regarding the patient during pregnancy, labour, and the puerperium, are as follows:—

I. Questioning, with the object of eliciting her previous medical history and symptoms.
II. Inspection.
III. Abdominal palpation.
IV. Vaginal examination.
V. Auscultation.
VI. Pelvimetry.

The History of the Patient.

The information, which must be elicited regarding the history and symptoms of the patient, differs, to some extent, according as we are dealing with a patient during pregnancy or during labour.

During pregnancy the following information must be obtained:—

(1) Date of last menstruation; date of quicken-

ing ; date at which the movements of the fœtus were last felt.

(2) Changes noticed in the size and appearance of the abdomen and breasts.

(3) Condition of the general health previous to pregnancy and during pregnancy.

(4) Number and nature of previous pregnancies, if any.

(5) Nature of previous labours. Are the children alive or dead ? If dead, did they die prior to or during labour or after delivery, and what was the cause of death ?

(6) Condition of urinary system. Amount of urine passed daily. Presence of any urinary trouble, such as too frequent micturition.

(7) Condition of digestive system. Presence of nausea, vomiting, loss of appetite, indigestion, constipation, diarrhœa.

(8) History of any organic disease.

(9) Presence of any abnormal condition of the genital organs—*e. g.*, vaginal discharge, pruritus vulvæ, prolapse of the vagina, etc.

During labour the following information must also be obtained :—

(1) When did the uterine contractions begin ?

(2) Have the membranes ruptured ? If so, how long ?

(3) Is there any inclination to "bear down"—*i. e.*, to exert the voluntary muscles of labour ?

Inspection.

A general inspection of the patient is made with

the object of determining the presence of the usual appearances of pregnancy, of any obvious signs of ill-health, of abdominal tumours, or any marked deformity which could give rise to difficulties during labour.

The usual appearances of pregnancy are present to a varying degree in correspondence with the period of pregnancy, and are as follows :—

(1) The face :—Alterations in complexion and aspect.

(2) The breasts :—Alterations in size, shape, and appearance.

(3) The abdomen :—Alterations in size, shape, and appearance.

(4) The vulva and vagina :—Alterations in appearance.

The nature of these alterations will be dealt with later (*v.* page 80).

An obvious indication of ill-health is furnished by an appearance of undue emaciation or cachexia, or by the presence of anæmia, œdema, jaundice, or glandular enlargements.

The presence of abdominal tumours may be suggested by the enlargement of the abdomen out of proportion to the age of the pregnancy, and perhaps by the irregular and asymmetrical character of the enlargement.

The existence of marked pelvic deformity may be suggested by the following conditions :—

(1) Undue prominence of the abdomen, or a pendulous abdomen.

(2) Diminutive stature.

(3) Curvature of the spine—kyphosis, lordosis, or scoliosis.

(4) Crooked legs, legs of unequal length, or absence of one leg.

Abdominal Palpation.

Abdominal palpation is by far the safest method of examining a pregnant woman, and it yields most important information. It is carried out as follows:—

Place the patient flat upon her back, with her pelvis straight and her legs extended and slightly separated, and then sit down at her right side about the level of the pelvis and facing her head. Next, gently lay both hands flat upon the abdomen about the level of the umbilicus, and by rotating them about endeavour to feel if the abdomen contains a tumour. The hands should be warm, and we must be very careful to avoid undue pressure, which makes the patient contract her abdominal muscles, and so renders further palpation impossible. Avoid also lifting the finger-tips off the abdomen—playing the piano on the abdomen—as this also causes contractions of the recti. Move the fingers and hands gently from place to place without lifting them off. If the pregnant uterus is felt, ascertain the height of the fundus in order to determine how far pregnancy has advanced (*v.* page 82). At the same time, observe whether the surface of the uterus is smooth and regular in conformation, as this shows that there are no sub-peritoneal tumours, such as myomata; also notice whether there is any enlarged organ or tumour in the abdomen except the uterus. Then, palpate the uterine contents in order to determine with what degree of clearness and definition

they can be felt, and whether there is anything except the uterine and abdominal wall between the fingers and them. This enables us to judge whether the quantity of liquor amnii is excessive, and whether there are any interstitial or submucous tumours of the uterus. While this is being done, notice that the uterus is contracting intermittently, and ascertain from the patient whether the contractions are, or are not, accompanied by pain, as this assists in determining whether she is or is not in labour.

In order to determine the presentation and position of the fœtus, the uterus must be palpated in a special manner by four distinct "grips," or methods of applying the hands. For the first three grips, our position with regard to the patient is similar to that which has just been described; for the last grip our position must be altered. The first grip is termed the *fundal grip*. To make it, lay both hands gently flat upon the fundus of the uterus, and feel what is lying there (*v.* Fig. 16). As a rule, one pole of the fœtus will be felt under the hands, either in the middle line or deflected to the left or right. Attention to the following points will enable us to decide which pole it is.

(1) *Its mobility.* When the membranes are intact, the head can be made by means of a sudden push with the fingers to float about from side to side, *i. e.* ballott, independently of the body of the fœtus, owing to its cervical articulation. The breech, on the other hand, can only be moved from side to side *en bloc* with the back.

(2) *Its shape.* The head is smooth and round, and separated from the body by a transverse groove

—the groove of the neck. The breech is not quite so smooth and round, but the difference in this respect is not very great. There is no groove to be felt between it and the body, and the feet may be felt lying beside it.

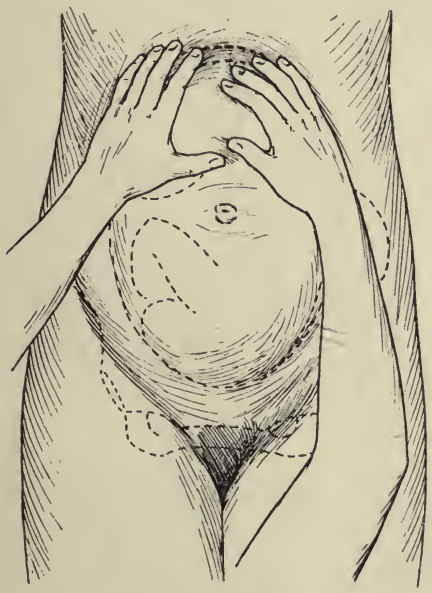


Fig. 16.—Abdominal palpation. The fundal grip.

(3) *Its consistency.* The head is considerably harder than is the breech, but both the consistency and the shape of the fundal pole of the fœtus are often much obscured by the placenta.

Having palpated the fundus, move the hands gently downwards until the level of the umbilicus is reached, and there make the *umbilical grip*

(*v.* Fig. 17). By rotating the hands about, the nature of the fœtal parts at this level can be ascertained. Either the resisting plane of the back will be felt, or the irregular outlines of the limbs. In polar and oblique presentations, the back lies

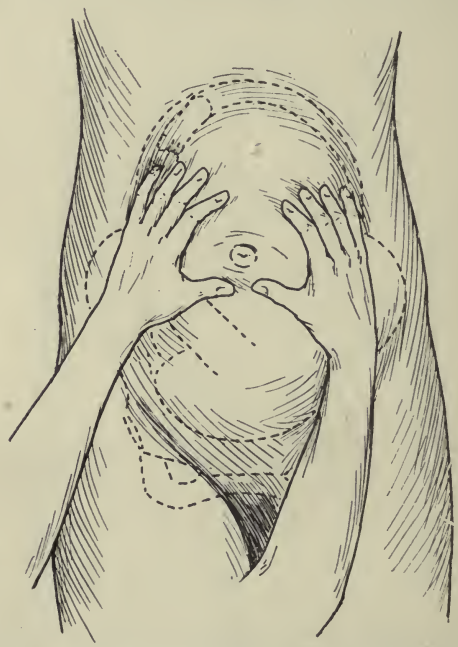


Fig. 17.—Abdominal palpation. The umbilical grip.

more or less obliquely in the long axis of the uterus. In true transverse presentations, it lies horizontally, but this condition is very rare. If the abdominal walls are very thick, and there is a consequent difficulty in feeling the fœtal back, lay the hands flat on each side of the uterus and move them

synchronously, first to one side then to the other, making the uterine contents move with them. By this means, one notices that there is a greater resistance offered to one hand than to the other. This greater resistance is on the side at which the back is.

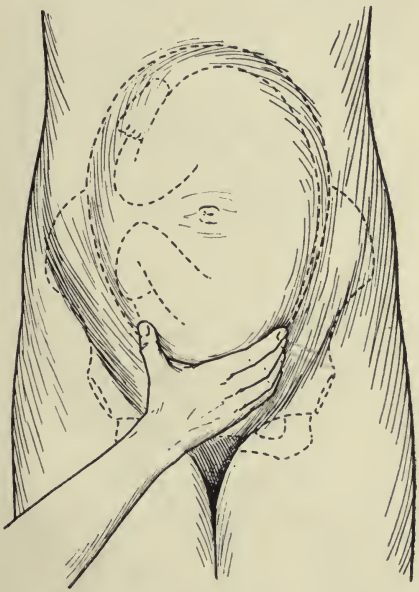


Fig. 18.—Abdominal palpation. Pawlic's grip.

The next two grips are *pelvic grips*. The first, *Pawlic's grip*, is made with the right hand only (*v.* Fig. 18). Sink the fingers into the false pelvis over the centre of Poupart's ligament on the left side, and the thumb into the corresponding point on the right, and then approximate them. By this grip we can discover whether the pelvic brim is occupied

by the fœtal part or is empty, and what the fœtal part, if any, is. If the patient is not in labour, and the presenting part fills the pelvic brim, it can

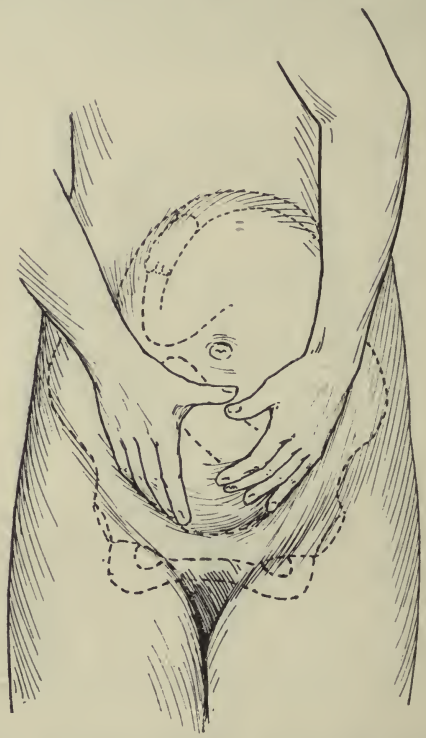


Fig. 19.—Abdominal palpation. The second pelvic grip.

only be a vertex (Pinard). If the presenting part is freely moveable, we can determine whether it is a head or a breech, in the same manner as if it was at the fundus. If the patient is in labour, and the presenting part is fixed, we feel the outline of the

chin or occiput and the groove of the neck, in the case of the head; while the breech is more irregular

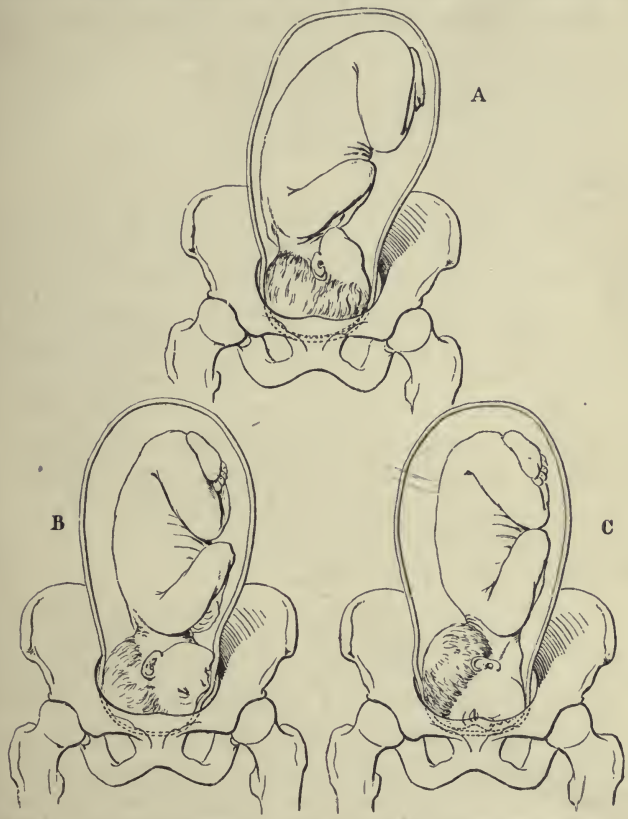


FIG. 20.—Relative position of the chin and occiput in vertex (A), brow (B), and face (C) presentations, as ascertained by abdominal palpation (diagrammatic).

and larger, and the lower limbs can be felt near it. The different presentations of the head (vertex, face, brow) can be determined chiefly by noting the

relationship, in point of height above the pelvic brim, between the occiput, *i. e.* the portion of the cephalic tumour which occupies the pelvis at the same side as that on which the back is, and the chin. If the chin lies higher than the occiput, it is a vertex presentation; if it lies lower, it is a face; and if both lie at the same level, it is a brow (*v.* Fig. 20).

These three grips are usually sufficient to tell all that is required. If, however, the presenting part has sunk deeply into the brim, another form of pelvic grip, the fourth grip, will be necessary in order to feel it. To practise this grip two hands are required; and, in place of facing the patient's head, we turn so as to face her feet (*v.* Fig. 19). Then, sink the tips of the fingers of the right hand into the true pelvis at one side, and the tips of the fingers of the left hand similarly at the other side. By this means, the extent that the presenting part has descended can be estimated.

To make more obvious the method of palpation, we shall describe a case in which the child is lying in the first vertex position. On making the *fundal grip*, a large, firm, and rounded tumour is felt at the fundus, lying slightly to the right of the middle line, and proceeding from it is felt the back of the child on the left, and perhaps the limbs on the right. There is no groove between the round tumour and the back, and on moving the tumour, it moves *en bloc* with the back. It is thus obviously the breech. By the *umbilical grip*, the back is felt on the left, and, on moving the hands laterally, the greatest resistance is felt upon that side. By

Pawlic's grip, another hard rounded tumour is felt in the pelvic brim. It is hard and slightly smaller and rounder than the fundal tumour, and between it and the back is a groove running obliquely—the groove of the neck. This groove, and also the tumour, lie higher above the pelvic brim upon the right side than upon the left. If the tumour is not fixed it can be moved about—ballotted—independently of the back. These points distinguish it as a head; and the fact that the tumour is higher above the pelvic brim on the right than on the left, shows that the chin is higher than the occiput, and therefore that the vertex is presenting.

The presentation and position of the fœtus having been determined, the next point is to ascertain the relationship of the presenting part to the pelvic brim. Accordingly we must endeavour to answer the following questions :—

(1) Is the presenting part fixed ?

(2) How deeply has it entered the pelvic cavity ?

(1) *Is the presenting part fixed ?*—The answer to this question gives most important information, when it is taken in connection with the number of children the patient has had and the duration of labour. It can be determined by grasping the presenting part as in Pawlic's grip (*v.* Fig. 18), and endeavouring to move it laterally. If this can be done, the presenting part is not fixed. We have mentioned the general rule as to the fixity of the presenting head at term in primiparæ and in multiparæ. In the former, it is fixed during the last three or four weeks of pregnancy, in the latter, it may not fix

until the commencement of labour. There are several conditions which tend to prevent the fixation of the head :—

(*a*) Contracted pelvis, or tumours about the brim of the pelvis.
(*b*) Pendulous abdomen, or obliquity of the uterus.
(*c*) Hydramnios.
(*d*) Multiple pregnancy.
(*e*) Placenta prævia.
(*f*) Malpresentations of the head.
(*g*) Hydrocephalic head.

The diagnosis between these various conditions must be made by the further examination of the patient. It is, however, well to accept as a general rule that, when the head ballotts freely above the brim at a time at which it should be fixed, pelvic contraction is the first condition to be thought of.

(2) *How deeply has the presenting part entered the pelvic cavity ?*—The answer to this question tells us the progress labour is making, indeed this fact can best be determined by noting the descent of the presenting part. In the early stages of labour, the height of the chin above the pelvic brim can be measured in finger-breadths. As labour advances, the chin approaches the level of the pelvic brim, and then sinks below it. The rate of advance can then be determined by the fourth grip. This is a more reliable method of determining the advance of the head than is a vaginal examination. In all cases of delayed labour with strong uterine contractions, the caput succedaneum hourly increases in size and bulges downwards more and more ; con-

sequently, we may easily be led, when making a vaginal examination, to attribute the diminished distance between the caput and the perinæum to the descent of the presenting part, instead of, as may be the case, to the increasing size of the caput succedaneum.

The final points to be determined by abdominal palpation are :—

(1) The extent to which the uterus has contracted down upon the ovum.
(2) The height of the retraction ring.
(3) The condition of the round ligaments.
(4) The character of the uterine contractions.

(1) *The extent to which the uterus has contracted down on the ovum.*—This is determined by noting the degree of mobility of the fœtus inside the uterus.

(2) *The position of the retraction ring.*—The retration ring is not noticed in normal labours, as it does not rise at all, or only very slightly, above the symphysis. In delayed labour, however, the ring is always rising higher into the abdomen, according as the muscle fibres retract and the upper uterine segment thickens. If this ring rises more than an inch and a half above tbe symphysis, it constitutes one of the signs of threatened rupture of the uterus, and is an indication for immediate delivery. It has to be distinguished from the condition present in the case of a distended bladder, as the depression which is found above the latter is not unlike the retraction ring. A distended bladder may usually be recognised by obtaining fluctuation in it, and, if a catheter is

passed, the depression disappears. Also, the depression at the top of a full bladder lies horizontally, or is crescentic with the concavity downwards, while the depression over the retraction ring runs obliquely from side to side, as the uterus never retracts uniformly over both sides of the fœtus.

(3) *The condition of the round ligaments.*—By moving the fingers gently across the body of the uterus, the left round ligament can readily be felt as a thick cord running upwards over the surface of the uterus. The right ligament, as a rule, is not felt, owing to the partial dextro-rotation of the uterus round a vertical axis. It is important to note whether the ligament has become tense, and the degree to which it stands out from the uterus.

(4) *The character of the uterine contractions.*—By laying the hand flat upon the uterus, the intensity and duration of the uterine contractions can be appreciated. Normally, they should be intermittent, but, if labour is unduly prolonged, they become continuous or tonic.

The estimation of these four points enables us to recognise the effect that labour has had upon the muscle fibres of the uterus, and consequently to know with a greater or less degree of certainty whether the patient has been too long in labour or not (*v.* page 149).

In certain conditions of the patient it may be impossible to obtain much information from abdominal palpation :—if she will not allow her abdominal muscles to relax ; if there is very little liquor amnii, or if the liquor amnii has escaped for a long time, and the uterus is contracted down upon the fœtus ;

and, if there is a great excess of liquor amnii—hydramnios.

Vaginal Examination.

The next method of examining a patient is *per vaginam*, and the following is the manner in which such an examination is carried out :—The external genitals of the patient are first carefully washed with soap and water, and then sponged with lysol or corrosive sublimate solution. The examiner washes and disinfects his hands, as has been described (*v.* page 3), and puts on rubber gloves. The patient then lies on the left side, her buttocks well over the edge of the couch, and the thighs flexed to a right angle. The examiner, standing beside the couch, with the finger of his left hand raises the right labium majus so as to expose the vaginal orifice, and then passes the index and middle finger of his right hand into the vagina and upwards to the cervix. The first points to be determined are the extent to which the cervix has been taken up and the size of the uterine orifice, or the size of the "os" as it is commonly termed. The extent to which the cervix has been taken up is determined by noting the thickness of cervical tissue which lies between the examining finger and the presenting part. In doing this, due allowance must be made for the softness of the cervix—a condition which renders it difficult to appreciate the exact thickness of the cervical tissue. The size of the uterine orifice is determined by sweeping the fingers round its edges. It is important to remember that it is sometimes hard to

distinguish in a primipara between a cervix which is fully taken up, but in which the uterine orifice is undilated, and a full dilatation of the uterine orifice. The reason of this is that, in the former case, the cervical tissue is so thinned that it is as easy to feel

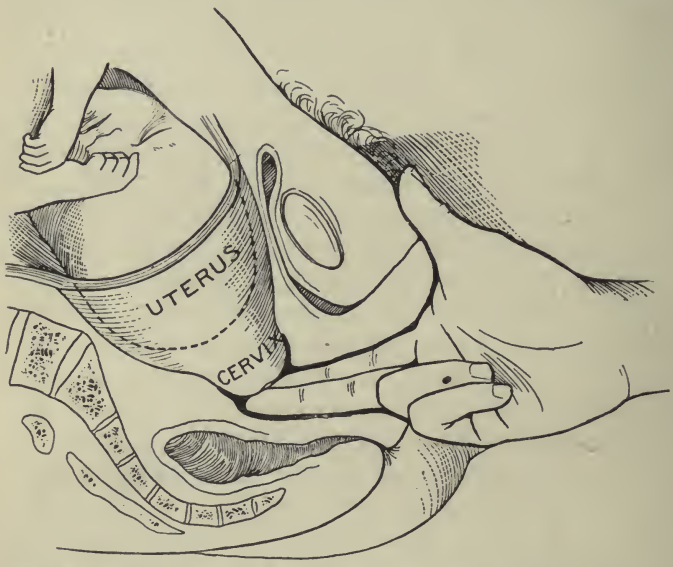


Fig. 21.—The cervix as felt by vaginal examination at the commencement of labour. (A large part of the wall of the uterus has been taken away in order that the position of the fœtal head may be seen.)

the outlines of the presenting part through it as if there was nothing intervening between the fingers and the presenting part. Hence, it is always important to feel carefully for the edges of the os. If this is done, and the edges cannot be felt, it is certain that the uterine orifice is fully dilated.

As soon as the condition of the cervix has been determined, endeavour to push the presenting part upwards, in order to ascertain if it is fixed or not. If it is not fixed, palpate the edges of the brim to ascertain the presence or absence of a recognisable deformity. At the same time, ascertain whether

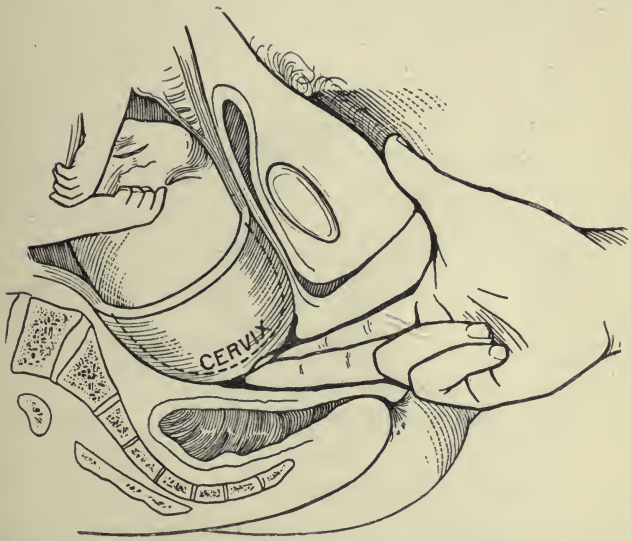


Fig. 22.—The cervix and presenting part as felt by vaginal examination after the cervix has been taken up into the lower uterine segment.

the membranes are ruptured or not. Then, examine the presenting part, ascertain its nature, and note how far it has descended into the pelvis.

The presenting part can be determined by noting its size, shape, and characteristics. A vertex and a breech both feel to be firm rounded tumours; but, on the vertex, which is more regular in outline, are

felt the sutures and fontanelles; on the breech, the anus, the tip of the coccyx, and the two tubera ischii. The face at the commencement of labour is very irregular, but when its features are obscured by a large caput succedaneum it also feels smooth and rounded. It is recognised by feeling the mouth, with the tongue and alveolar ridges, and the supra-

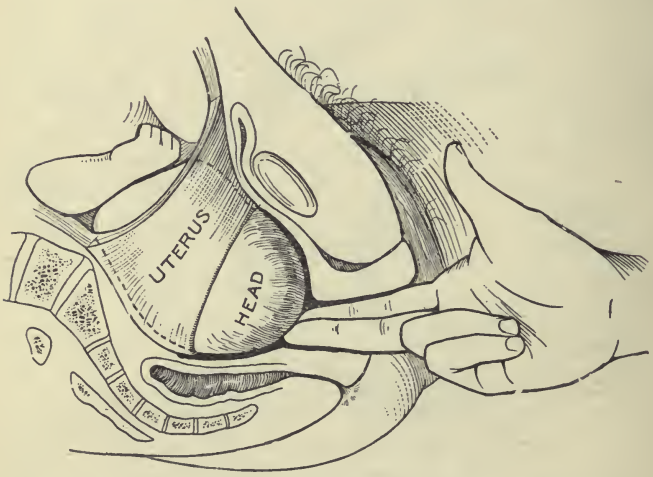


Fig. 23.—The presenting vertex as felt by vaginal examination during the second stage.

orbital ridges. A brow is recognised by feeling, on one side of the presenting part, the anterior fontanelle and the smooth frontal bone; and on the other, the supra-orbital ridges and the edges of the orbital cavity. A foot can be distinguished from a hand by feeling the heel; by noting that the line of the tops of the toes is straight, of the tops of the fingers curved; and that the thumb can be apposed

and opposed, while the great toe cannot. The knee can be distinguished from the elbow by its greater size; by feeling the patellar ligament and the patella, if the knee is not flexed; and especially by feeling the tuberosity of the tibia.

While examining the presenting part we shall also determine whether any part of the ovum—as the cord, or of the fœtus—as a limb, has prolapsed into the vagina. In the former case, ascertain whether the cord is pulsating or not; in the latter case, ascertain whether the prolapsed limb is an arm or a leg, and the side to which it belongs.

If a uterine contraction comes on during our examination, we shall further be able to appreciate the rate of advance of the presenting part and the extent to which the membranes protrude into the vagina during a pain.

Normally, the protrusion of the membranes is slight and in strict proportion to the size of the os; in other cases, they project downwards into the vagina as a cone-shaped tumour, and may even reach the perinæum. This undue protrusion of the membranes is never found in a normal case, but can always be noticed when the presenting part, or the shape of the pelvis, is abnormal. In a normal case, the presenting head fills the lower uterine segment completely; consequently, before rupture of the membranes, the liquor amnii in front of the head is completely shut off from the liquor amnii round the body. When a contraction occurs, the head acts as a ball-valve, and prevents any more liquor amnii from being driven down in front of it (*v.* Fig. 24). Consequently, the tension on the membranes is

increased only in proportion as the head advances, and their premature rupture is avoided. If, however, the presenting part does not fill the lower

FIG. 24.—Diagram showing the manner in which the head normally fills the lower uterine segment exactly.

uterine segment exactly, owing to its irregular shape —as in face, breech, or transverse presentations, or if it is prevented from descending into the lower uterine segment—as in the case of contracted pelvis,

then there is free communication between the waters in front of the presenting part and the

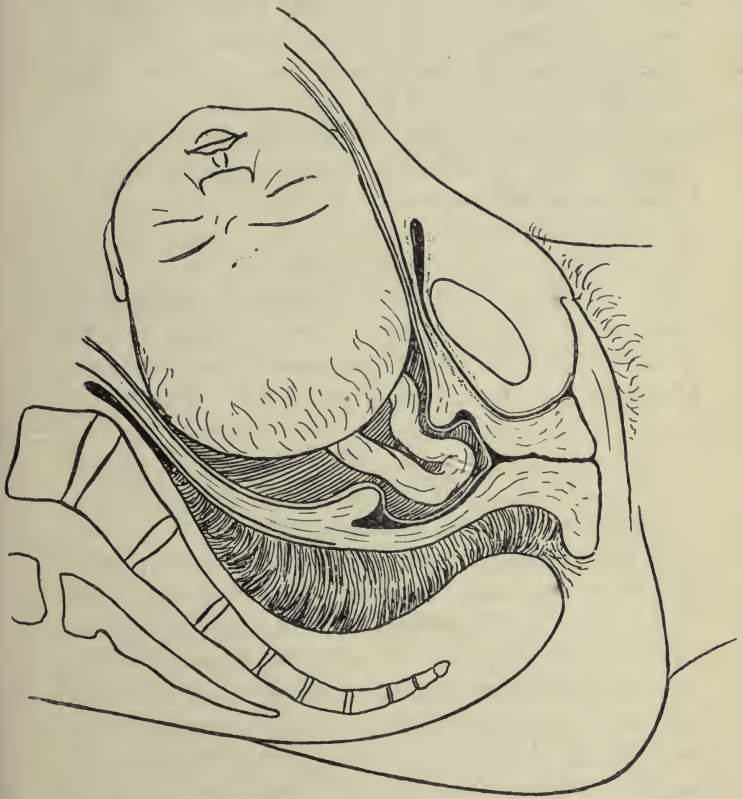


Fig. 25.—Diagram showing a head not filling the lower uterine segment exactly, thus permitting undue pressure on the membranes, and favouring their early rupture, and prolapse of the cord.

waters behind it. The result of this is, that, when a contraction occurs, the liquor amnii round the

body is driven downwards in front of the presenting part, and the pressure on the membranes is very greatly increased. This increased pressure causes, at first, undue bulging of the membranes downward, and, when the os has become partly dilated, their premature rupture (*v.* Fig. 25). When, therefore, this cone-shaped projection of the membranes is present, we immediately suspect that there is something abnormal, either in the pelvis, or in the presentation.

Lastly, sweep the fingers round the pelvic cavity and thus ascertain as far as possible the presence or absence of pelvic deformity or tumours, and the condition of the vaginal walls,—lax and moist, narrowed by cicatrices or dry, as the case may be.

Auscultation.

Auscultation of the fœtal heart enables us to ascertain the vitality of the fœtus; also to supplement abdominal palpation in diagnosing the presentation and position of the fœtus, as the part of the abdomen over which the heart is heard with maximum intensity, depends upon the relationship of the fœtus to the uterus. Let us imagine the abdomen divided into quarters by one line drawn vertically, and another drawn horizontally, through the umbilicus. Then, if the head is in the lower uterine segment, the heart will, as a rule, be heard best below the transverse line; and, if the head is in the fundus, it will be heard best above or on the same line. If the back, in a vertex or breech presentation, is to the left of the vertical line, the heart is as a rule

heard best to the left of that line; if to the right of the line, the heart is heard to the right.

It is of great practical interest to recognise the relative merits of these three modes of examining a patient, as, while palpation and auscultation are free from danger so far as the patient is concerned, vaginal examination is not.

There are no difficulties in the way of making a vaginal examination; but, unfortunately, there is an ever-present danger. Very many puerperal women die as a result of septic infection; and, if there were no vaginal examinations, there would be no cases of acute sepsis in previously healthy women. If, then, vaginal examination could be entirely abolished, or, at any rate, the number of vaginal examinations reduced to a minimum, very many lives would be saved. Let us see how far it can be replaced by abdominal palpation.

If we compare the information afforded by abdominal palpation and vaginal examination respectively, we shall see that, while many facts can be determined by abdominal palpation which cannot be determined by vaginal examination, there are very few facts which can be determined by vaginal examination alone. What are these facts? The most important is the diagnosis of prolapse or presentation of the cord. This certainly cannot be determined by palpation. It is a most important condition to recognise, and, therefore, one vaginal examination, at all events, must be made, save in those cases in which the presenting part was deeply engaged in the pelvis from the commencement of

labour, as it is obvious that prolapse could not then occur.

Other points, that can be determined by vaginal examination alone, are the extent to which the cervix has been taken up and the uterine orifice dilated, the presence of intra-pelvic tumours, of fontanelle presentations, and asynclitism of the head. These points, however, can all be determined by a single vaginal examination.

The best time at which to make a vaginal examination is at the commencement of labour. If the head is then fixed, or fixes soon after, further vaginal examinations are unnecessary. If, however, the head is not fixed, another examination should be made as soon as the membranes rupture on account of the risk of prolapse of the cord. All this points to the extreme importance of acquiring skill in practising abdominal palpation. If we possess it, the number of vaginal examinations can be very greatly restricted.

Examination by auscultation will only replace vaginal examination to a very limited extent. In conjunction with abdominal palpation, it affords a means of diagnosing the presentation and position of the fœtus. Its most important use is, however, to inform us of the condition of the fœtus—information which cannot be obtained by means of either of the other modes of examination.

Pelvimetry.

Pelvimetry is the term applied to the measurement of the various diameters and distances of the pelvis. It is a method of diagnosis which is only

required in cases in which the history of the patient, her appearance, or the information furnished by abdominal palpation or vaginal examination, lead us to suspect the existence of a contracted pelvis.

Pelvimetry may be external or internal. A little information can be obtained by means of the former—especially in the greater degrees of contracted pelvis, the most valuable information by means of the latter—in all cases. The principal external measurements of importance are as follows :—

(1) The distance between the anterior superior spines of the ilium.

(2) The distance between the most distant portions of the iliac crests.

(3) The external conjugate, or Baudelocque's diameter—*i. e.*, the distance between the upper margin of the symphysis and the depression under the spinous process of the last lumbar vertebra.

(4) The distance between the posterior superior spines.

(5) The transverse diameter of the outlet—*i. e.*, the distance beween the tubera ischii.

(6) The antero-posterior diameter of the outlet—*i. e.*, the distance between the tip of the coccyx and the lower margin of the symphysis.

(7) The distance between the trochanters.

These measurements can be obtained by means of an external pelvimeter such as Martin's. The method of using this instrument is simple and does not require much explanation. To measure the distances between the superior iliac spines, the iliac crests, or the tro-

chanters, the patient lies on her back with her legs close together, while the examiner stands or sits below the level of the hips, and facing her. He then takes the pelvimeter in both hands, holding the extremities of the limbs between his thumb and middle finger, and with the index fingers determines the exact positions of the points on which the instrument is to

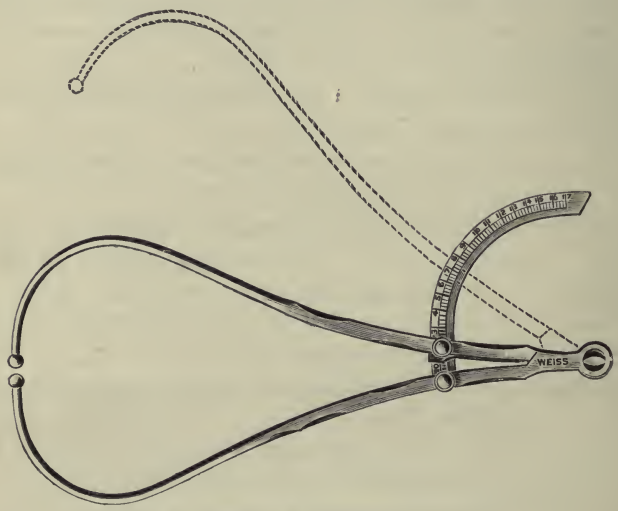


Fig. 26.—Martin's external pelvimeter.

rest. The tips of the instrument are then placed on these points, and the distance between them read off on the scale. To measure the external conjugate the patient lies on her side with her back turned towards the operator. The instrument is held as before, and one limb is pressed firmly into the depression beneath the spine of the last lumbar vertebra, while the other is placed on the upper margin of the symphysis.

To measure the distance between the posterior superior spines, the patient lies on her side or on her face, and the tips of the pelvimeter are applied to the depressions which mark the positions of the spines. To measure the distance between the tubera ischii, the patient must be placed in the lithotomy position. The inner margin of the tubera ischii are found, and the thumbs are so placed that the nails are directly over the points to be measured. An assistant then ascertains the distance between the nails with a pelvimeter with the blades crossed. To measure the antero-posterior diameter of the outlet, the patient is placed on her side with her back towards the operator. The position of the sacro-coccygeal joint is determined by passing the index finger into the vagina and palpating the tissue intervening between it and the thumb placed over the termination of the sacrum externally. One terminal of the pelvimeter is then placed on this joint, and the other on the sub-pubic ligament of the symphysis. From the measurement thus obtained, a deduction of one to one and a half centimetres (0·4 to 0·6 inch) must be made to compensate for the thickness of the sacro-coccygeal joint.

The principal internal measurements of importance are as follows :—

(1) The true conjugate—*i. e.* the distance between the promontory of the sacrum and the most prominent part of the back of the symphysis.
(2) The oblique conjugate—*i. e.* the distance between the promontory of the sacrum and the lower margin of the symphysis.
(3) The transverse diameter—*i. e.* the greatest

distance between the lateral margins of the brim.

These measurements can be ascertained as follows: —With the fingers, we can measure the oblique conjugate, and from this we can then estimate the true conjugate. To measure the oblique conjugate,

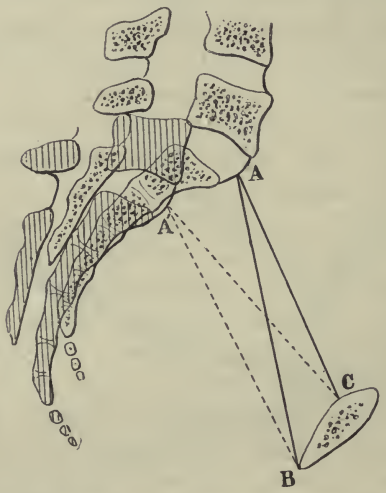


FIG. 27.—Diagram showing the manner in which the relationship between the true and the oblique conjugate is affected by the height of the promontory. A. Normal position of the promontory. A'. Unusually low promontory.

place the patient in the cross-bed position, and under an anæsthetic if possible. Introduce the index and middle fingers into the vagina, and pass them upwards until the promontory of the sacrum is reached. While the fingers are in this position, mark, with the nail of the index finger of the other hand, the spot at which the sub-pubic ligament

crosses the index finger of the measuring hand. Then withdraw the fingers, and measure the distance between the tip of the middle finger and the mark on the index finger. This is the *oblique conjugate.* To obtain the true conjugate, on an average half

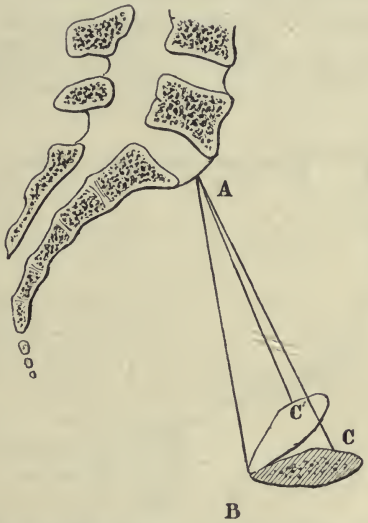


FIG. 28.—Diagram showing the manner in which the relationship of the true and the oblique conjugate is affected by the obliquity of the symphysis. B C'. Normal inclination of the symphysis. B C. A symphysis lying almost horizontally.

an inch must be subtracted, but the exact amount differs in each case. If the symphysis lies more horizontally, or if the promontory is lower than is normal, half an inch will be too much to subtract. If the symphysis lies more vertically, or if the promontory is higher than is normal, half an inch will be too little (*v.* Figs. 27 and 28). Therefore, in

order to ascertain the exact amount that it is necessary to subtract, we must allow for :—

(1) The obliquity of the symphysis.

(2) The height of the promontory.

The ability to determine the proper correction can only be obtained by constant practice. This is the great drawback to internal measurements taken with the fingers, to overcome which various forms of internal pelvimeters have been devised. Of these,

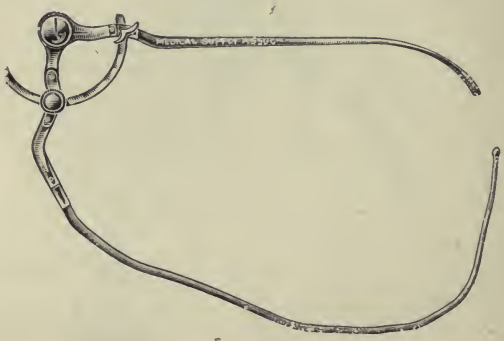


Fig. 29.—Skutsch's pelvimeter.

very much the best is that bearing the name of Skutsch.

Skutsch's pelvimeter, if carefully worked, gives far more reliable information than the fingers (*v.* Figs. 29 and 30). It consists of three parts—a rigid limb with a slight curve upon it, a flexible limb, and a circular movable bar which connects the two. The rigid and the flexible limbs lock into one another, in such a manner that either the concave or the convex aspect of the rigid bar can be turned towards the flexible bar. The moveable connecting bar is

so adjusted that the limbs can be separated from one another, and then returned to exactly the same

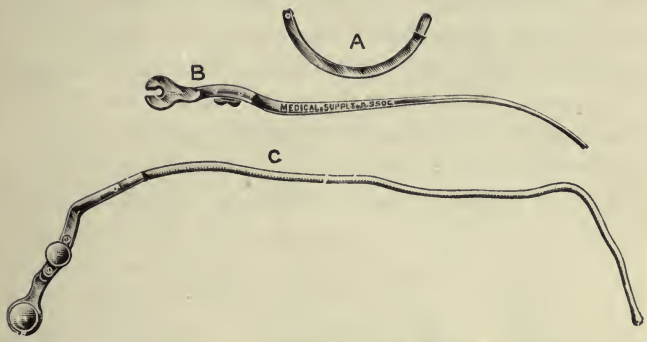


Fig. 30.—Skutsch's pelvimeter. A. Movable connecting bar. B. Rigid limb. C. Flexible limb.

position. This is necessary in order to facilitate its removal from the pelvis.

In order to use the pelvimeter, the patient should

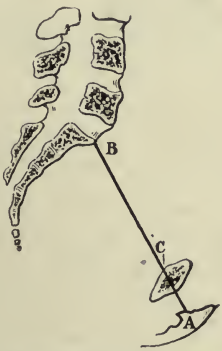


Fig. 31.—Diagram representing the distances measured, when ascertaining the length of the true conjugate.

as a rule be anæsthetised. To measure the true conjugate a mark is made with an aniline pencil on

the skin over the centre of the symphysis (*v.* Fig. 31). The instrument is then so adjusted that the rigid limb curves away from the flexible limb. Pass two fingers of the right hand into the vagina, and upwards until they lie against the promontory of the sacrum. Then slip the rigid limb of the instrument upwards, along the fingers, until it rests on the most prominent point of the promontory. Hold it exactly in this position, while an assistant bends the flexible limb until it just touches the blue mark

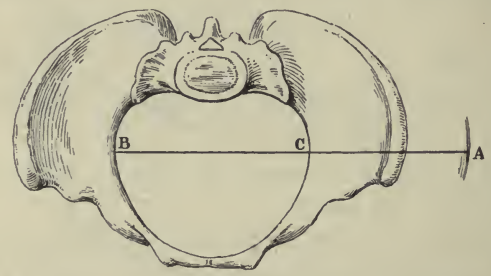


Fig. 32.—Diagram representing the distances measured, when ascertaining the length of the transverse diameter.

over the symphysis (A B, Fig. 31). The instrument is then carefully withdrawn, and the distance between the extremities of the limbs measured. Next, reverse the rigid limb, so that it curves towards the flexible one. Introduce the fingers again into the vagina and feel for the most prominent point on the back of the symphysis. Guide the rigid limb up until it rests on this point, and hold it there, while the assistant bends the flexible limb until it presses against the blue mark with the same degree of force that it did when taking the first measurement (A C, Fig. 31). Separate the limbs before removing the

instrument, as otherwise they may be forced apart. Then remove it, and adjust the limbs to their original position. Subtract the distance between them, *i. e.* the thickness of the symphysis, from the former measurement, and the result is the length of the true conjugate.

In order to measure the transverse diameter, make a mark over the great trochanter of the femur at one side (*v.* Fig. 32 A). With the rigid limb in the vagina, under the guidance of the right hand, measure the distance from this mark to the most distant point of the pelvic brim, at the opposite side (A B, Fig. 32). Then, in a similar manner, but with the left hand in the vagina, measure the distance from the blue mark to the nearest point of the pelvic brim, on the same side as the mark (A C, Fig. 32). Subtract the measurement thus obtained from the first measurement, and the result is the transverse diameter. From these measurements, and from the palpation of the pelvic brim we can deduce the nature and the degree of the contraction.

CHAPTER V.

PREGNANCY AND ITS PHENOMENA.

Definition—Duration—Phenomena of: Changes in the Uterus, the Decidua: Changes in remainder of Genital Tract, Vagina, Tubes, Ovaries, Ligaments: Changes in Pelvic Joints: Breast Changes: Mechanical Effect of Growing Uterus: Remote Effects of Pregnancy, Circulation, Respiration, Urinary System, Digestive System, Nervous System, Pigmentation.

Definition.—Pregnancy is the term applied to the condition of a woman when she contains within her the product of conception. It commences with the fertilisation of the ovum, and ends with the expulsion of the latter.

Duration.—The duration of pregnancy is usually considered to be ten lunar months, or nine calendar months and seven days, or 280 days, such period being counted from the first day of the last menstruation. In a large number of cases in which pregnancy resulted from a single coitus, the average duration was found to be from 272·2 to 273·5 days (Loewenhardt, Hasler, Hecker). It is usually considered that impregnation is most likely to occur a few days before, or a few days after, a menstrual period. Ahlfeld's statistics—obtained from cases in which pregnancy followed a single coitus—do

not, however, bear out the view that just before a menstrual period is a likely time. According to these statistics, in 37 per cent. of cases, the coitus had occurred in the first week after menstruation; in 35 per cent., in the second week; in 15 per cent., in the third week; in 9·7 per cent., in the fourth week; in 2·7 per cent., on the 29th to 31st days.

The Phenomena of Pregnancy.

Changes in the Uterus.—The uterus in its fully developed virginal condition is a pear-shaped organ, somewhat flattened from before backward. Its average dimensions, as given by Waldeyer, are as follows:—

	Nulliparæ.	Multiparæ.
Length of entire uterus	2⅗ in. (6·5 cm.)	3 in. (7·5 cm.).
„ corpus uteri	1⅗ „ (4 „)	1⅘ „ (4·5 „).
„ cervix uteri	1 „ (2·5 „)	1⅕ „ (3 „).
„ entire cavity	2⅕ „ (5·5 „)	2⅗ „ (6·5 „).
„ cavity of body	1⅕ „ (3 „)	1⅗ „ (4 „).
„ „ cervix	1 „ (2·5 „)	1 „ (2·5 „).
Greatest width of body	1⅗ „ (4 „)	1⅘ „ (4·5 „).
„ thickness	1 „ (2·5 „)	1⅕ „ (3 „).

It weighs from seven to twelve drachms (33 to 41 grms.), and its cavity has sufficient capacity to hold one or two drops of fluid.

At full term its condition is very much altered. It is then from twelve to fourteen inches (31—36 cm.) in length, nine and a half inches (24 cm.) in width, and from eight to nine inches (21—23 cm.) in depth. Its weight has increased to something between a pound and a half and three pounds (681—1362 grms.), and its cavity has a capacity

of about two hundred and fifty to three hundred cubic inches (4000—5000 c.cm.). The gradual manner in which this increase in size takes place is shown by the following table. It must be noted that in the table pregnancy is divided into nine calendar months instead of, as is done elsewhere through this book, into ten lunar months.

	Length. In.	Cm.	Width. In.	Cm.	Depth. In.	Cm.
End of 3rd month	4·5 – 5	(11 – 12·5)	4	(10)	3	(7·5).
„ 4th „	5·5 – 6	(13·5 – 15)	5	(12·5)	4	(10).
„ 5th „	6 – 7	(15 – 18)	5·5	(13·5)	5	(12·5).
„ 6th „	8 – 9	(20 – 22½)	6·5	(16·5)	6	(15).
„ 7th „	10 – 11	(25·5 – 28)	7·5	(19)	6·5	(16·5).
„ 8th „	11 – 12	(28 – 30·5)	8	(20)	7	(18).
„ 9th „	12 – 14	(30·5 – 35·5)	9·5	(24)	8–9	(20–22).

(*Farre and Tanner.*)

According as the uterus gradually increases in size, the fundus rises gradually higher in the abdomen. In the non-pregnant state, the uterus lies with its anterior surface in approximation with the bladder, and with the tip of the cervix on a level with the line joining the ischiatic spines. At full term, the fundus of the uterus is found midway between the umbilicus and the ensiform cartilage. Its size and position in the intermediate months is shown by the following table (*v.* Fig. 33).

At the end of	2nd	month	the uterus is the size of a large orange.
„	3rd	„	„ „ fœtal head at term.
„	4th	„	the fundus is half way between the symphysis and the umbilicus.
„	5th	„	„ two fingers' breadth below the umbilicus.
„	6th	„	„ at umbilicus.

At the end of	7th	month the fundus is	three fingers' breadth above umbilicus.
„	8th	„ „	midway between umbilicus and ensiform cartilage.
„	9th	„ „	up to ensiform cartilage.
„	10th	„ „	same as at eighth month.

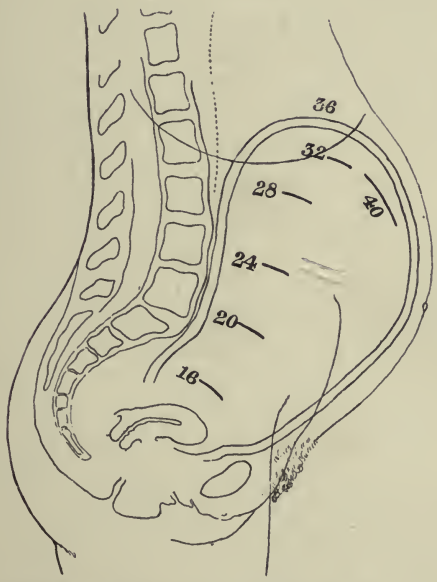


Fig. 33.—Diagram showing the height of the uterus at the different weeks of pregnancy.

In the early months of pregnancy, the increase in the size of the uterus is due to eccentric hypertrophy of its walls. In the later months, on the other hand, increase is due to the mechanical distension caused by the growing ovum, without any

accompanying increase in thickness in the muscle wall. As a result, there is an actual thinning of the walls, a thinning which is more or less marked in different cases.

In addition to the alterations which occur in the size and position of the uterus, important changes take place also in the muscular coat, mucous membrane, ligaments, and vessels. "The colour of the uterus becomes darker, its tissue less dense, and its muscular bundles more evident. A very great increase takes place in the muscular tissue, this increase being mainly the result of the enlargement of the already existing elements; the cells become enlarged to the extent of from seven to eleven times in length, and from two to five times in breadth (Kölliker). A formation of new cells is also said to occur, mainly in the innermost layers (but whether by proliferation of pre-existing cells, or otherwise, is not stated), and to continue until the sixth month of pregnancy, when it ceases. The round ligaments become enlarged, and their muscular structure more marked; the broad ligaments are encroached upon by the intrusion of the growing uterus between their layers. The mucous membrane and the glands of the uterus at first undergo an enlargement very similar to that which precedes menstruation. Subsequently they become the seat of peculiar changes, whilst the membrane of the cervix loses its columns and rugæ. The blood-vessels and lymphatics are greatly enlarged, and it is observed that the arteries become exceedingly tortuous as they ramify upon the organ. The nerves also undergo considerable increase in size." (Symington.)

In addition to the alteration in its lining membrane, the cervix as a whole undergoes two changes. The first of these is a gradual softening of its tissue, a softening which commences at the tip and gradually extends upwards until the whole cervical tissue is affected. This is due to a vascular engorgement and serous infiltration of the cervical tissue. The second change is known as the "apparent shortening" of the cervix. This condition is also a progressive change, and is due to three factors :—

(1) The progressive softening of the cervical tissue makes it difficult to feel the softened tissue with the examining finger.

(2) The softening and relaxation of the cervico-vaginal attachments, allow the drawing upwards of the entire cervix as a result of the progressive increase in size of the uterus. This drawing upwards may cause an actual shortening of the vaginal portion of the cervix, although the length of the cervical canal remains unchanged ; and, consequently, the shortening will be apparent not only on digital examination, but also if the cervix is examined through a speculum.

(3) At the commencement of pregnancy, the axis of the cervix more or less corresponds with the axis of the pelvic brim. As pregnancy continues, and as the uterus increases in size, the junction of the cervix and uterus is pushed backwards, and the anterior fornix becomes partially effaced. The result is that the os externum approaches the anterior vaginal wall, and consequently the cervix does not protrude so much into the vagina. Accordingly the cervix seems to be shortened, although in reality

the change probably results in a certain degree of lengthening (*v.* Fig. 34).

Another effect of pregnancy on the cervix is that the cervical canal becomes occluded owing to the presence of a firm plug of mucus, the result of the increased activity of the cervical glands. This plug, which has been already mentioned, is known as the *operculum*.

The changes, which take place in the mucous

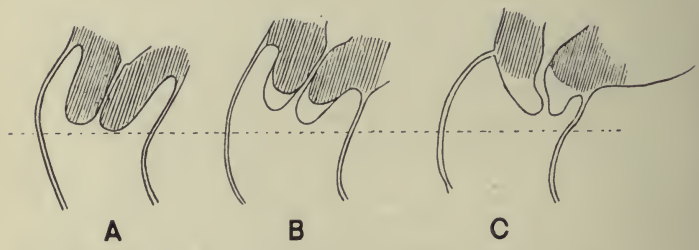


Fig. 34.—Diagram to show the changes in the position and consistency of the vaginal portion of the cervix during pregnancy. A. Cervix at commencement of pregnancy. B and C. The unshaded portion shows the progressive softening of the cervix. The latter is also drawn up and tilted forwards against the anterior vaginal wall.

membrane of the uterus, lead to the formation of the decidua.

The Decidua.—The decidua is the term applied to the hypertrophied and altered mucous membrane of the uterus. It forms the third and outermost covering of the ovum, and serves as a bond of union between the latter and the uterine blood-vessels.

When the fertilised ovum enters the uterus, it makes its way into the thickened mucous membrane, in

which it becomes completely embedded, the minute entrance through which it effected an entrance being closed by a plug of fibrin. The manner in which the ovum effects its entrance is still obscure, but it is usually thought to be due to a destructive action which the outer layer of epiblastic cells is said to

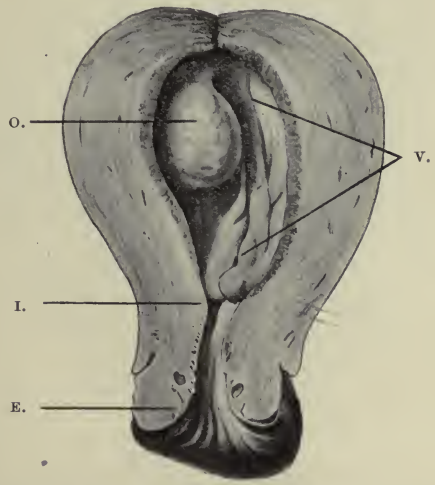


Fig. 35.—Uterus at fourth week. O. Ovum covered by decidua capsularis. V. Decidua vera. I. Internal os. E. External os. (*Bumm.*) (About one-third natural size.)

exert upon the maternal tissues whenever it comes into contact with them (Peters). To this outer layer of epiblastic cells, the term trophoblast is usually applied.

The destructive action of the trophoblast continues for a short time after the embedding of the ovum, with the result that the walls of the adjacent maternal capillaries are broken down, and that ma-

ternal blood escapes into the tissues surrounding the ovum. The destructive action then ceases, and, instead, the ovum exerts a stimulating effect upon the endometrium, which hypertrophies all over the body of the uterus, and is converted into the decidua.

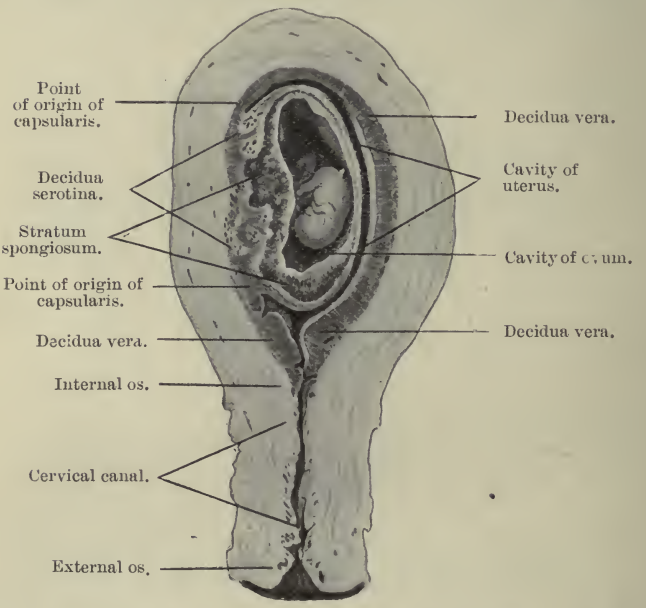


FIG. 36.—Uterus at second month of pregnancy (*Bumm*). (About two-thirds natural size.)

There are three terms applied to the decidua, according to its situation with regard to the ovum. The portion of decidua which lies directly between the ovum and the uterus is known as the *decidua serotina* or *decidua basalis*. It eventually becomes the site of the placenta. The remainder of the

decidua which lines the uterus is known as the *decidua vera* (*v.* Figs. 35, 36). Lastly, the layer of

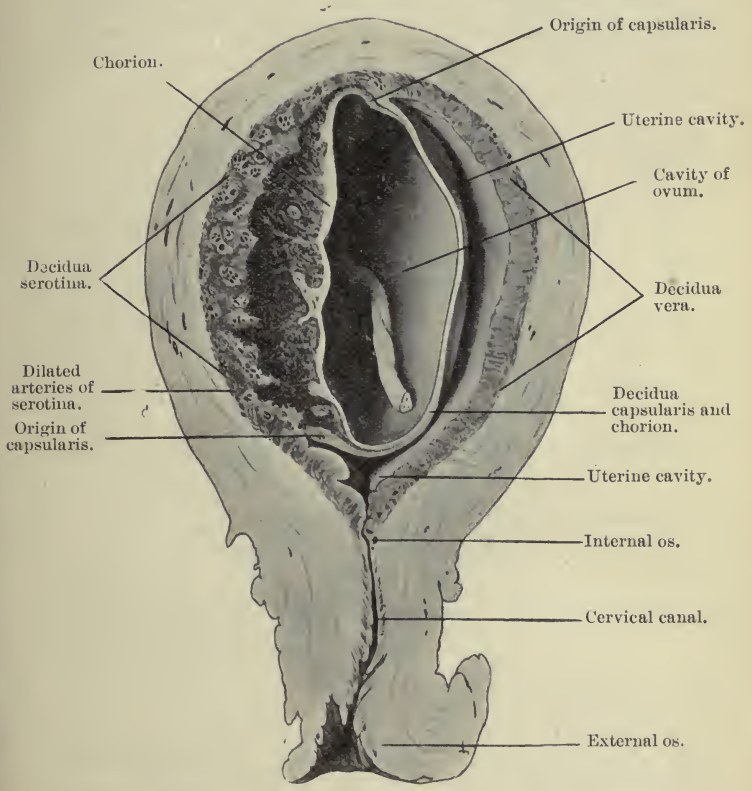


FIG. 37.—Uterus at third month (*Bumm*). (About two-thirds natural size.)

decidua which covers the ovum is known as the *decidua capsularis*, or *decidua reflexa*.

Hypertrophy of the decidua continues until about the fifth month, when it has reached its maximum

thickness of three quarters to seven eighths of an inch. Owing to the dilatation and twisting of the uterine glands, during this period, the deeper layer of the decidua presents a spongy appearance, and on section

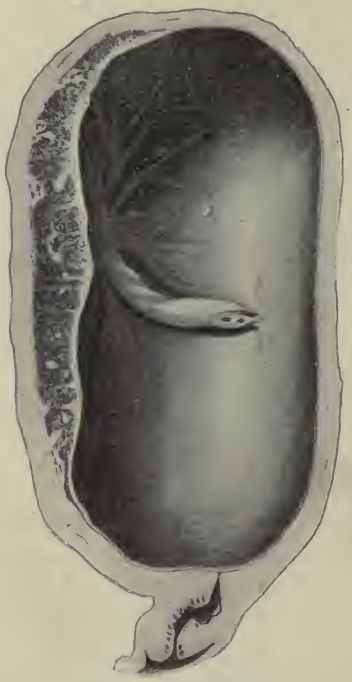


Fig. 38.—Uterus at tenth month (*Bumm*). (About one-fourth natural size.)

shows a series of cavities. This layer is hence known as the *stratum spongiosum*. The glands also hypertrophy in the portion of decidua between the stratum spongiosum and the uterine cavity, but not to so great an extent, and in consequence this layer

is more compact in appearance and is known as the *stratum compactum.*

After the third month, as a result of its growth, the ovum is beginning to fill the uterine cavity, and, in consequence, the decidua capsularis is coming into contact with the decidua vera—a process which, when complete, results in the blending of the two to form one layer and the obliteration of the decidual space which previously existed between the decidua capsularis and vera. From this on, the combined decidua thus formed atrophies, probably as a result of the increasing pressure which the growing ovum exercises upon it. Its vessels become thrombosed, and, by the time full term is reached, the decidua capsularis has practically disappeared, but the decidua vera is still present. The chief characteristics which distinguish the decidua from the endometrium may be summarised as follows (Eden) :—

(1) There is a formation of "decidual cells" from existing connective-tissue cells.

(2) There is a hypertrophy and dilation of the uterine glands, the deepest portion of these especially becoming widened.

(3) The increased vascularity leads to the formation of widely dilated capillaries, or sinuses, and to interstitial hæmorrhages.

(4) There is a partial loss of surface epithelium.

(5) The decidua is divided into two layers, a superficial compact layer, and a deep cavernous layer.

(6) The decidua averages from three-quarters to seven-eighths of an inch in thickness, the endometrium averages one twenty-fifth of an inch.

Changes in the Remainder of the Genital Tract.—*The vagina.*—The mucous membrane and the muscular wall of the vagina become hypertrophied and turgid, and, as a result of vascular engorgement, the mucous membrane becomes of a more or less deep violet colour. During the third and fourth month, the elevation of the uterus draws up the anterior vaginal wall, and so stretches the mucous membrane; but, subsequently, as a result of hypertrophy, the latter comes to hang in transverse folds, which may appear at the vulva. The follicles of the vulva secrete more actively, and varicosities of the veins often appear in the same region.

The Fallopian Tubes.—The Fallopian tubes also hypertrophy, and lengthen as the uterus rises. As the fimbriated extremity remains in the neighbourhood of the ovary, the tubes, towards the end of pregnancy, are almost perpendicular to the brim of the pelvis. Further, in consequence of the growth of the fundus, the tubes at the end of pregnancy enter the uterus at the junction of its upper and middle thirds, instead of at its highest part, as in the non-pregnant state.

The Ovaries.—The ovaries are drawn slightly above the pelvic brim, and are brought close to the sides of the uterus as the result of the growth of the latter outwards into the layers of the broad ligament, and also of the upward stretching of the broad ligament itself. During pregnancy, ovulation is said not to occur. The corpus luteum, *i. e.* the remains of a Graafian follicle, left by a discharged ovum, is an interesting structure. It is formed by the growth of the wall of the empty follicle. This wall is

thrown into folds, which, as they increase in extent, encroach on the cavity of the empty follicle, until this has become entirely filled. In addition, a considerable development of blood-vessels occurs, and these run, accompanied by fibrous tissue, into the folds into which the wall of the follicle is thrown, giving off capillaries which ramify in the wall. The cells of the membrana granulosa of the follicle are thrown off and disappear, and are replaced by

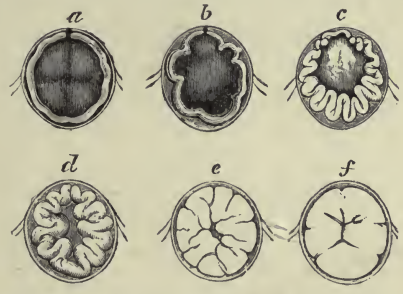


Fig. 39.—Diagram of the formation of the corpus luteum. *a*. The cavity of the follicle filled with blood. *b, c*. The clot diminishing in size, while the epithelial lining becomes thickened and convoluted, and the clot decolourised. *d, e, f*. Completion of this process. In *f* the convolutions have coalesced, remaining only as a central stellate cicatrix. (*Galabin.*)

numerous polygonal cells, which are said to be derived from the membrana granulosa. These cells are epithelial in appearance, and contain a yellow pigment. They are usually known as "lutein cells," and the pigment is known as "lutein." The sharp differentiation, which at first existed between the corpus luteum and the surrounding ovarian tissue, gradually lessens, and, after a time, the two merge, and in this way the corpus luteum disappears. The central

cavity of the follicle is at first occupied by a blood-clot. As the walls hypertrophy, they gradually press more and more upon this clot, and it in turn shrinks, becomes decolourised and organised, and finally is represented by a stellate-shaped cicatrix lying in the centre of the convoluted and hypertrophied follicle walls.

If the discharged ovum is impregnated, the corpus luteum reaches a marked degree of development in consequence of the hyperæmic condition of the ovary. Its maximum size is not reached until the third month, it is still found at the time of delivery, and it does not entirely disappear until two months after that event. Its yellow colour is more marked, and its convolutions are firmer to the touch.

The ligaments.—The round ligaments, the muscle-fibres and blood-vessels of the broad ligaments, and the pelvic cellular tissue share in the general hypertrophy and vascular engorgement. The left round ligament as a rule can be felt through the abdominal wall in patients who are not very stout, owing to its increase in size and to the fact that the uterus is dextro-rotated.

Changes in the Pelvic Joints.—As pregnancy advances, the cartilages of the sacro-iliac and the sacro-coccygeal joints become softened, and their synovial cavities enlarged. As a result, the power of walking is somewhat interfered with, and in some patients may be almost lost. We shall refer later to the effects, during parturition, of this temporary relaxation of the joints (*v.* page 140).

Breast Changes.—The first change noticed in the breasts comes on about the second month, and

consists in an enlargement of the superficial veins and of the breast itself. At the same time, the nipple and primary areola have a puffy appearance,

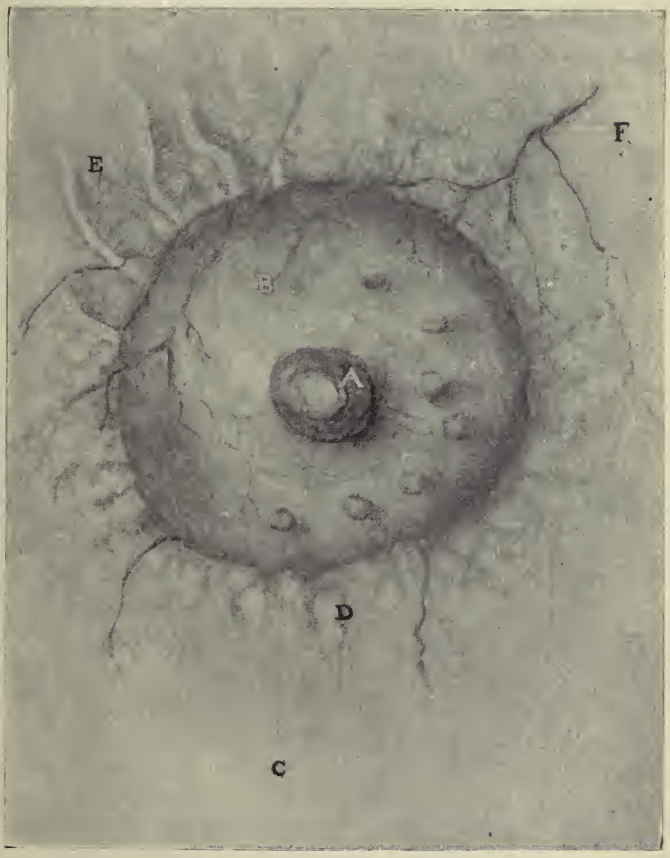


Fig. 40.—Breast at the seventh month of pregnancy. A. Nipple. B. Primary areola. C. Montgomery's follicle. D. Mottling of secondary areola. E. Striæ. F. Enlarged veins. (*Montgomery.*)

and glandular follicles develop upon the latter (Montgomery's follicles). During the next couple of months, the colour of the primary areola deepens in proportion to the complexion of the patient, and its diameter is increased. During the fifth month, the secondary areola becomes noticeable round the primary areola—"numerous round spots or mottled patches of a whitish colour scattered over the outer part of the areola, and for about an inch or more all round, presenting an appearance as if the colour had been discharged by a shower of drops falling upon the parts" (Montgomery). From the sixth month on, shining red lines radiating from the primary areola appear, due to rapid over-distension, and akin to the *striæ gravidarum* of the abdomen (*v.* Fig. 40). On palpation, from the second month onward, the breasts are found to be firmer and more knotty than in non-pregnant women. If they are squeezed, colostrum may exude from the nipple.

Mechanical Effects of the Growing Uterus.—As the uterus grows, it produces definite and well-marked pressure and distension effects upon the adjacent organs. The increased weight of the uterus causes increased pressure upon the bladder in the early months, and consequent irritability of the bladder and frequent micturition. As the uterus rises out of the pelvis, this trouble disappears to a great extent or altogether, but often returns in the later months as the result of the pressure of the fœtal head. Constipation frequently occurs as the result of interference with the peristaltic action of the intestines, which, as the uterus grows, are pushed upwards, backwards, and to the sides. Pressure upon the

intra-pelvic veins gives rise in many cases to the formation of varicosities of the veins of the legs, and may sometimes even cause œdema. Varicosities of the vulvar and anal veins may also occur from the same cause. The distension of the abdominal walls results in two very constant occurrences—the formation of *lineæ* or *striæ gravidarum*, and the obliteration of the umbilical depression. Striæ gravidarum are reddish or bluish lines radiating upwards from the mons Veneris, and due to a loss of elasticity in, and to tearing of, the cutis vera and the rete Malpighii, consequent on the stretching caused by the enlarging uterus. They occur during the last three months of pregnancy, and subsequent to delivery they become white. Occasionally, they may become the seat of a serous or lymphatic infiltration. They may also occur on the skin covering the buttocks, the thighs, and the breasts. The umbilical depression disappears during the seventh or eighth month, and during the last month its place is taken by a small knob-like elevation. Separation of the recti muscles may also occur, especially in cases of excessive enlargement of the uterus, and in pluriparous women.

During the early part of the tenth month the pressure of the uterus interferes with the movements of the diaphragm and so causes dyspnœa. Disturbance of digestion from pressure upon the stomach may also occur. Both these symptoms subside somewhat during the last fortnight, in consequence of the sinking of the uterus.

Remoter Effects of Pregnancy.—*Circulation*.—In order to allow for the increased uterine circulation the total quantity of blood in the body is increased,

but the increase occurs more in the watery than in the solid constituents. There is an increase in the proportion of fibrin-forming substances, and in the number of white blood-corpuscles, and a diminution in the proportion of red blood-corpuscles to white blood-corpuscles, and in the proportion of albumen. The heart becomes somewhat dilated, with a rather more than compensatory hypertrophy, a condition which is probably due to the extra amount of work thrown upon it and to the increased blood pressure. Another consequence of this increase in pressure is seen in the enlargement which takes place in the thyroid gland and the spleen.

Respiration.—An increased discharge of carbonic acid through the lungs takes place, and has been estimated to be as much as twenty-five per cent. The transverse diameter of the chest increases and the vertical diameter diminishes, their united effect being to leave the capacity of the chest practically unaltered. Respiration becomes almost entirely thoracic in character.

Urinary system.—The kidneys are as a rule increased in size and somewhat congested. The quantity of urine is increased, a change due to the increase in the water. There is also an increase in the total amount of solids excreted. A peculiar substance named kyesteine was described by Nauche as occurring only, and constantly, in the urine of pregnant women, and consequently as being a valuable diagnostic sign of pregnancy. It shows its presence by the occurrence of a cloud in urine which has been allowed to stand for some days protected from dust. The cloud rises to the surface

of the urine as a scum, and eventually breaks up and falls to the bottom after two or three days. It is formed as a product of decomposition, and contains triple phosphates, vibrios, and monads. The presence of kyesteine is of no value from a diagnostic point of view, as it occurs in the urine of non-pregnant women, and even of men. Kyesteine is also said to contain an albuminoid substance allied to casein, and if such is the case it may be in some manner connected with the absorption of milk from the breasts. The presence in the urine of a copper reducing substance, which has been found to be lactose, and which gives rise to the so-called physiological glycosuria, can be detected in a small proportion of women. It is also probably connected with the absorption of milk.

Digestive system.—Slight disturbances in the digestive system occur in a large proportion of pregnant women. They manifest themselves by the occurrence of nausea, vomiting, salivation, pyrosis, and constipation. Usually the appetite is increased, but sometimes it is diminished. The general nutrition of the body is—if anything—improved, as is evidenced by the increase in weight of the patient during the last three months—an increase which is more than can be accounted for by the growth of the ovum. The average increase is said to be 5 lb. 4 oz. (2400 grms.) during the eighth month, 3 lb. 11 oz. (1690 grms.) during the ninth month, and 3 lb. 6 oz. (1540 grms.) during the tenth month (Hecker and Gassner).

Nervous system.—Disturbances of the nervous system are, to a varying degree, the rule during

pregnancy. They are due to the exalted and hyper-irritable condition of the nerve centres. They evidence themselves by the occurrence of neuralgias, disturbance of digestion, hysterical attacks, unnatural wishes or cravings—the so-called *pica* or "longings" of pregnancy,—faintings, cutaneous eruptions, and alterations in the temperament.

Pigmentation.—A deposit of pigment usually occurs in the following regions :—the areolæ of the breast, the lower part of the abdomen and the groins, the axillæ, along a line running from the pubes to the umbilicus or even as far as the ensiform cartilage, and beneath the eyes and about the temples (chloasma uterina).

CHAPTER VI.

THE DIAGNOSIS AND MANAGEMENT OF PREGNANCY.

The Diagnosis of Pregnancy—Subjective Symptoms—Objective Symptoms—The Doubtful, Probable, and Certain Signs of Pregnancy– Estimation of the Date of Pregnancy—Is the Fœtus Alive or Dead?—Management of Pregnancy.

The Diagnosis of Pregnancy.

One of the most important questions that comes before the medical practitioner, is the task of diagnosing the existence or non-existence of pregnancy. The diagnosis may be all-important, and the result of a mistake disastrous. The practitioner who undertakes the consideration of the question should always remember, that though the evidence may be tolerably certain so far as he is concerned, still his diagnosis must be guarded unless absolute certainty dictates it.

The diagnosis is based on certain subjective and objective symptoms.

The most important subjective symptoms of pregnancy are :—

(1) **The Cessation of the Menses.**—This, in all probability is an invariable accompaniment of pregnancy. Cases have been recorded of supposed men-

struation during the first three months, but such cases are perhaps more correctly considered to be hæmorrhages of pregnancy. At all events, it is obvious that menstruation cannot occur after the decidua vera has coalesced with the decidua capsularis, *i.e.* after the third month. In estimating the value of amenorrhœa as a diagnostic sign, it must however be remembered that amenorrhœa due to disease is not an uncommon condition, particularly in chlorotic or anæmic girls, and also that slight irregular hæmorrhages—which the patient may term menstruation—occasionally occur in the early months of pregnancy.

(2) **Morning Sickness.**—Nausea, slight retching, or actual vomiting when the patient wakes in the morning is a very common accompaniment of pregnancy. It usually commences at the beginning of the second month, and persists until the end of the fourth month (*v.* page 277).

(3) **Quickening.**—This is the term applied to the sensation experienced by the mother when she first feels the fœtal movements. It usually occurs about the eighteenth week, but its exact date is variable. In a multipara it is a sign of importance, as she is usually able to recognise its occurrence, but even in her case it is not infrequently simulated by, or mistaken for intestinal movements.

(4) **Salivation, etc.**—Salivation, pyrosis, and various nervous disorders are also included under this heading, as they are matters regarding which the patient informs the physician, in contra-distinction to the facts of which he informs himself by examination. Their diagnostic value is small.

The foregoing subjective symptoms are of slight importance when taken by themselves, as the patient may wilfully deceive us, or be herself deceived. But when we consider them in conjunction with the objective symptoms, and when we find that the one confirms the other, they then become of value.

And now to consider the objective symptoms. We shall assume that there is no difficulty in the way of a full examination of the patient. This being so, it is best to examine her in the routine manner adopted in disease.

The Face.—In some cases there is excessive pigmentation occurring at the sides of the nose, under the eyelids, and about the upper lip.

The Breasts.—The various changes which occur in the breasts have been already noted (*v.* page 94). The most important of them from a diagnostic point of view are :—

(1) The enlargement of the superficial veins and of the breast itself.

(2) The appearance of Montgomery's follicles (*v.* Fig. 33).

(3) The deepening of the colour of the primary areola.

(4) The formation of the secondary areola.

(5) The increased firmness of the breast.

(6) The presence of colostrum.

Some of these changes have also been noticed in cases of myomata of the uterus and ovarian tumours.

The Abdomen.—*Inspection.*—During the first two months of pregnancy there is a slight sinking in of the abdominal wall between the umbilicus and the symphysis, a condition due to the sinking of the uterus

into the pelvis, owing to its increased weight. From the end of the second month onwards, the abdomen enlarges in correspondence with the period of pregnancy. During the last three months, striæ or lineæ gravidarum appear as a result of the stretching of the abdominal walls. The abdomen may also be more or less pigmented, especially in the middle line and about the groin.

Percussion.—By this means, we can map out the size of the abdominal tumour, and determine whether it is dull or resonant. In this manner, flatulence and phantom tumours may be excluded.

Palpation.—From the third month onwards a tumour can be felt in the abdomen, and one can determine its size, its consistency, the regularity of its surface, and the irregularity of its contents. In pregnancy, the enlarged uterus feels smooth and ovoid, and irregularities in its contents, viz. the fœtal parts, can be felt, if pregnancy is sufficiently far advanced. The fœtus can be also moved about between the two hands,—that is, external ballottement (*ballotter*, to toss) can be obtained. As we examine, we notice that the uterus becomes hard from time to time, *i. e.* it contracts. There is no pain accompanying these contractions.

Auscultation.—Several different sounds can be heard over the abdomen of a pregnant woman :—

(1) *The fœtal heart.* This is heard from the sixteenth to the eighteenth week onward; it beats at the rate of 120 to 160 per minute, and sounds like the ticking of a watch. Its rate is diminished during uterine contractions and when the funis is compressed during delivery. It is increased owing to

feverish conditions of the mother, and after very active fœtal movements. The heart is heard best over whatever part of the fœtal trunk is most closely in contact with the anterior uterine wall.

(2) *The uterine souffle.* This is a blowing sound produced in the ascending branches of the uterine arteries; it is heard more plainly over some parts of the uterus than others, and, of course, is synchronous with the mother's pulse. It has been attributed to the flowing of blood through large tortuous arteries, and also to the altered quality of the blood in pregnancy, the latter circumstance determining the souffle as in the venous murmur of anæmia. The uterine souffle is heard towards the end of the fourth month, *i. e.* a little earlier than the fœtal heart. It may also be heard in cases of uterine tumours—as myomata.

(3) *The funic or umbilical souffle.* This souffle is produced in the vessels of the cord, probably in the umbilical vein. It is synchronous with the fœtal heart, and generally is caused by the cord being twisted round the child, or by its being compressed beneath the stethoscope. Its presence is said to be of unfavourable import for the child.

(4) *The maternal heart-sounds.* If these are rapid they may be mistaken for the heart-sounds of the child. To avoid this mistake the finger should always be placed on the mother's pulse whilst auscultating the fœtal heart.

(5) *Respiratory murmur of the mother.*

(6) *Movements of the child.*

(7) *Friction between uterus and abdominal wall.*

(8) *Crepitating noises.* These are due to air in uterus or abdominal walls.

(9) *The muscular susurrus.* This is the term applied to the note given out by contracting muscle-fibre.

(10) *Intestinal sounds—borborygmi.*

The Vulva and Vagina. — *Inspection.* — The vulvar and vaginal mucous membrane becomes of a bluish-purple colour, due to venous stasis. This is Jacquemin's and Spiegelberg's sign of pregnancy. It is sometimes noticed also in cases of uterine myomata and ovarian tumours when they attain any considerable size, but, in the case of pregnancy, it occurs with a smaller uterine enlargement than in the case of myomata.

Vaginal examination.—A vaginal examination is next made with the patient in the dorsal position, and it is upon the information it gives, supplemented by the patient's history, that we chiefly rely for the diagnosis of pregnancy in the early months. First, note the consistency of the cervix. It commences to soften from the beginning of pregnancy, and this softening starting below extends upwards as pregnancy advances, until at term it is so marked that the cervix can hardly be felt. It is more marked in multiparæ than primiparæ.

The next point to note is the size, shape, and consistence of the body of the uterus. Its size is increased in proportion to the duration of pregnancy (*v.* page 81); its shape has become more globular on account of the increase in its antero-posterior diameters; and its consistence is softer and more elastic.

Then try to obtain internal ballottement. It can be got by passing the fingers into the anterior

fornix and pressing suddenly upwards against the uterus. Keep the fingers in the same position, and, if the case is suitable, the displaced fœtus will be felt to fall back upon them, causing a slight sensation of shock (*choc en retour*). The occurrence of this phenomenon depends on two factors :—First, that the fœtus is large enough to be felt ; secondly, that it is sufficiently movable in the liquor amnii to be displaced easily. Both these factors are present during the fourth and fifth months. This sensation of ballottement can be simulated by other conditions :—a pedunculated myoma or malignant masses floating in ascitic fluid, and a large calculus lying in a distended bladder. The *choc en retour* is also very closely imitated by a pulsation of the uterine artery, under certain conditions. If, when pressing the fingers upwards, we compress the uterine artery, its pulsations cease. Then, as the pressure of the fingers is involuntarily lessened, the artery beats again, conveying an impression to the finger similar to that of ballottement. This mistake is of course easily avoided by keeping the fingers in the same position for a little longer, when the subsequent pulsations of the vessel will be felt.

Now attempt to get Hegar's sign of pregnancy,—the marked softening of the lower uterine segment. It is best obtained by passing the thumb into the vagina and one finger into the rectum, and then pressing the fundus downwards with the other hand on the abdominal wall, so that the lower uterine segment can be grasped between the finger and thumb. If pregnancy is present, the whole lower uterine segment is so softened that there seems to

be no connection between the fundus and the cervix. At the same time the fundus seems globular (*v.* Fig. 41). This is a tolerably reliable sign. It is found from the second-month onwards, but may possibly be obtained in a non-pregnant uterus, especially after complete or incomplete abortion.

Lastly, palpate the ureters, as they hypertrophy during pregnancy. To find them, palpate the back of the symphysis with the finger in the vagina, and then, starting above at one side of the joint, draw

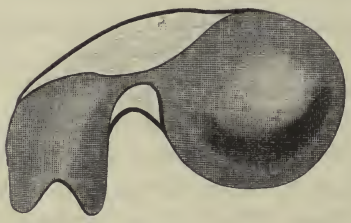


Fig. 41.—Hegar's sign of pregnancy. The heavy outline represents the *actual* shape of the uterus; the darkly shaded portion represents its *apparent* shape as ascertained by recto-vaginal examination. (*Norris.*)

the finger downwards and slightly outwards along the back of the pubes. The ureter, which here lies between the anterior vaginal and the posterior bladder wall, is displaced forwards against the pubes, and is felt to slip from under the finger. It will require some practice to be able to tell if it is enlarged or not. If it is felt at all by the student it is probably hypertrophied, as it is difficult to feel a non-hypertrophied ureter. While we are palpating the ureter, the increased pulsation in the lateral fornices will also be noticed.

Now, let us consider the value of these different signs. They can be divided into doubtful, probable, and certain signs, and can be classified accordingly.

Doubtful.	Probable.	Certain.
Nausea.	Breast changes.	The fœtal parts.
Salivation.	Internal ballottement.	The fœtal heart.
Pigmentation.	Blue colour of vagina.	Movements of fœtus when felt or heard by doctor.
Longings.	Increased pulsation in lateral fornix.	Funic souffle.
Cessation of the menses.	Softening of lower uterine segment.	
Enlargement of abdomen.	Enlargement of the uterus.	
	The occurrence of intermittent contractions.	
	Uterine souffle.	
	Hypertrophy of the ureters.	

In default of certain signs, a probable diagnosis can be made by noting a correspondence between the subjective and objective symptoms. For instance, if the duration of amenorrhœa corresponds to the size of the uterus, or if the date of quickening corresponds to either of them, then we have a very reliable clue to the situation. The diagnosis has to be made in the early months from any condition which may give rise to enlargement of the uterus, as subinvolution, metritis, or small myomata—the menstrual history will then usually suffice for a provisional diagnosis, also from acquired amenorrhœa, due to anæmia, phthisis, change of conditions of life, etc. The latter class of cases is much more difficult to diagnose, and a certain diagnosis can only be arrived at in course of time. In the later months a diagnosis has to be made from ovarian and uterine tumours

—particularly myomata, from ascites, flatulence, phantom tumours, etc. The menstrual history, the time occupied by the growth of the tumour, the absence of fœtal parts, and the possibility in some cases of separating the tumour from the uterus, will usually suffice to make the diagnosis. In *pseudocyesis* (ψεύδος, false; κυήσις, pregnancy) the abdomen is resonant, and if an anæsthetic is administered the tumour disappears.

When a diagnosis has been made of the existence of pregnancy, we have to decide how far pregnancy has advanced. This can be accomplished by various methods, none of them, unfortunately, being very exact. The first way that naturally occurs to us is to count the weeks that have elapsed since the last menstruation. This method, although uncertain, will usually bring us within a fortnight of the true period, if the woman's history is correct. We can confirm this by inquiring the date at which quickening occurred, especially in multiparæ, who are naturally more skilled in detecting fœtal movements. Quickening usually takes place about the eighteenth week, but here again there may be an error of about a fortnight, too much or too little.

Perhaps, more reliable than either of these methods is the information given by the height of the uterus. If the pelvis of the patient and the size of the uterus are normal, then by noting the height of the fundus we can tell at once in what month of pregnancy she is (*v.* page 82).

By comparing the various methods which have been described, the period of pregnancy can be estimated tolerably exactly, and the chance of

errors in the patient's history eliminated as far as possible.

Assuming that the height of the uterus tends to prove that the menstrual history may be relied on, we can tell approximately the date of delivery by the methods of Naegele or Matthews Duncan. Pregnancy is usually divided into ten menstrual periods of four weeks each, that is 280 days. Naegele counted from the first day of the last menstruation. He subtracted three months from that date, then added seven days, or in leap year six days if February were included in the time, and counted forward a year. For instance, if the patient began to menstruate on July 1st, count back three months, to April 1st; then add seven days, to April 8th; count forward a year; and the result will be the date of delivery. The method of Matthews Duncan is slightly different. He counted from the last day of last menstruation, and added on nine months and three days to it. If the menstruation which began on July 1st ended on July 5th, then nine months and three days added on brings the date to April 8th again.

When the menstrual history is unsatisfactory or cannot be obtained, we must base our calculation of the date of delivery on the height of the uterus at the time of examination. In order to facilitate this calculation, we have devised a table, which enables the date of delivery to be ascertained with very tolerable accuracy in a few moments. This table will be found in the appendix.

Reckoning from the date of *quickening, i.e.* the day on which the mother first feels the movements of the fœtus, and supposing quickening to occur at the

eighteenth week, by adding on twenty-two weeks we get the required date. The date thus found must not be considered absolute; it is the centre of a month during which delivery will probably occur.

The last question to be decided is, whether the fœtus is alive or dead. Of course, the fact that pregnancy is continuing is usually an indication that the fœtus is alive. The death of the child is usually followed by the onset of labour, but sometimes the ovum may be retained in the uterus. If the patient is past the sixth month, and still no heart can be heard on the most careful and repeated auscultation, the fœtus is probably dead. If the woman has felt the child frequently, and one day noticed unusually active movement, and after that a complete cessation of movement, the fœtus is probably dead. Lastly, if in conjunction with these symptoms we find that a uterus, which steadily increased in size up to a certain day, has ceased to increase any further, and rather is diminishing in size, the diagnosis is complete.

The woman's symptoms are also of importance. If the child has been dead for any length of time, she begins to lose her appetite, and to become thinner and weaker. She complains of a disagreeable taste in her mouth, and her face assumes a yellowish tinge. Then, on making a vaginal examination it may be possible to feel the cranial bones loose and movable under the skin. If the membranes have ruptured, the fœtus decomposes and a fœtid discharge comes away from the vagina.

The Management of Pregnancy.

As pregnancy is a physiological and not a pathological condition, it follows that its management is, in the main, merely an amplification of what ought to be the ordinary hygienic precautions of a woman. The great—and for a healthy woman—the only necessity, is to live during pregnancy as far as possible in conformity with the dictates of nature. Her diet should consist of simple wholesome food, without either undue restriction or excess. The same remarks apply to her drink. Excessive drinking of tea or coffee must be as consistently forbidden, as is excessive indulgence in other stimulants. The regular action of the bowels must be obtained most carefully, particularly by the use of such articles of food as have an aperient effect. Attention must also be paid to the action of the kidneys, and any decrease in the amount of urine carefully noted. Baths ought to be taken to at least the extent necessary for perfect personal cleanliness. If possible the patient should take a daily bath, but all extremes of temperature must be avoided. In addition, the external genitals should be bathed night and morning with warm water. Vaginal douching should not be permitted unless there is a necessity for it, such as the occurrence of leucorrhœa. If it is necessary, it should be administered at a temperature of 98° F., and at a low pressure. In the matter of dress, all garments which exert an undue pressure on any part of the body must be forbidden, particularly tight corsets, garters, or strings round the waist. In most cases the use of a properly adjusted

abdominal belt is of value, as it supports the abdominal walls ; in pluriparous women, with lax or separated recti muscles, it is a necessity. It must not, however, be worn too tight. Regular exercise in the open air should, so far as possible, be taken daily. Its character will depend largely on the position and previous habits of the patient, and on the nature of her previous pregnancies—if she is a multipara. In those cases in which previous abortions or hæmorrhages have occurred, special care must be taken to avoid sudden and violent movements. Long standing, excessive or too violent exercise, or the undue prolongation of exercise, must be avoided in all cases. Coitus should be as restricted as possible, and, in the case of patients who have had previous abortions, it should be forbidden. The mental condition of the patient must be carefully watched, and all causes of melancholy, irritation, and fright avoided as far as possible, while her surroundings should be such as will promote happiness and an even temperament.

The due care of the breasts is a most important point, especially in primiparæ. The physician should examine the nipples to ascertain if they are of a shape suited for nursing. If they are at all depressed, the mother must be taught to draw them out gently with her fingers several times a day, taking care not to use undue force, and to have perfectly clean fingers. Too violent attempts at forming the nipple, especially when they are made by an unskilled nurse, often result in causing slight lacerations in the delicate skin. Then, if the fingers or nipples are dirty, the cracks become infected, and mastitis may follow. In addition to

forming the nipples, the patient must bathe them, during the last three months, a couple of times daily, with some lotion which will harden the skin, as otherwise a strong and healthy child will cause great pain whilst nursing. The usual lotion used is alcohol in some form—*Eau de cologne*, whisky, or common methylated spirits. Begin with a weak solution and gradually increase the strength. Pure whisky may be used, but *Eau de cologne* must be diluted by adding an equal volume of water. Lanoline may also be rubbed into the skin to make it elastic.

CHAPTER VII.

LABOUR AND ITS PHENOMENA.

Definition of Labour—Causes—Stages—Phenomena, Uterine Contractions, Accessory Muscles of Labour, Effect of Uterine Contractions—Symptoms, Normal Labour, Abnormal Labour—Diagnosis.

Definition.—Labour is the term applied to the process which severs the connection between the mother and the ovum, and removes the latter from the organism of the former (Winckel). The process is classified as follows :—

(1) *Abortion,* when it occurs before the formation of the placenta, *i. e.* before the commencement of the fourth lunar month.

(2) *Partus immaturus,* or *miscarriage,* when it occurs after the formation of the placenta, but before the child is viable, *i. e.* from the commencement of the fourth to the end of the seventh lunar month.

(3) *Partus prematurus,* or *premature birth,* when it occurs after the child has become viable, but before full term, *i. e.* before the end of the tenth lunar month.

(4) *Partus maturus,* or *full-term birth,* when it occurs at the end of the tenth lunar month.

(5) *Partus serotinus*, or *delayed birth*, when it occurs more than forty-one weeks after conception.

At present we are concerned only with *partus maturus*, or full-term birth.

Causes.—It is little known what the factors are which cause a pregnant uterus to contract at the tenth menstrual period after conception, and to expel its contents. So far, our views are but the results of conjecture. We know that certain changes occur during pregnancy, and we infer a consequence for them. What these changes are we shall state in a few words :—

(1) The uterus and ovum increase in size during pregnancy. In the earlier months the uterus grows more rapidly than the ovum, but in the later months the ovum grows faster than the uterus. Hence, it comes about that, towards the end of pregnancy, the growing ovum gradually becomes too large for, and so exerts a distending pressure upon, the uterus. The uterine muscle in turn reacts against this pressure, and drives the ovum against the internal os, which in consequence commences to dilate.

(2) During the entire period of pregnancy, the uterus shows a certain amount of irritability and a tendency to contract intermittently. This irritability is especially marked at the menstrual period, and becomes more marked with each successive period. It shows itself by the painless contractions of the uterus—an intermittent series of contractions which can be felt by laying the hand upon the uterus, especially in the later months of pregnancy.

(3) The cells of the decidua vera undergo a partial necrosis towards the end of pregnancy.

(4) During and after the fifth month, large multinucleated masses derived from the syncytium appear in the decidua serotina. These masses increase in number, and about the eighth or ninth month are said to grow into the veins which carry the return flow of blood from the placental sinuses, and so obstruct the flow through them. As a result the blood in the sinuses contains an increased quantity of CO_2 gas.

(5) There is one motor centre for uterine contraction in the medulla oblongata, and excess of carbonic acid gas in the general circulation of the mother stimulates it. The rapidly growing fœtus daily extracts more oxygen from the maternal blood, and returns, instead of it, a daily increasing quantity of carbonic acid gas, thus furnishing the excess of CO_2 necessary to stimulate the centre in the medulla. Direct stimuli applied to the uterus also cause contraction by means of a reflex centre in the spinal cord, and the CO_2 in the uterine sinuses here acts as the stimulus. On the other hand, it may be that it is not the excess of CO_2 so much as the diminution of oxygen that acts thus (Runge).

These are the facts which we know. What conclusions may we draw from them? We have a series of changes occurring in the uterus and its contents, changes that become more marked daily as pregnancy advances. The uterus is becoming more and more distended by the growing ovum, and one day it must become over-distended. The irritability of the uterine muscle is increasing daily,

and is tending to cause a separation between the ovum and the uterus. The necrosis of the decidual cells is paving the way for this separation to occur more easily. Once it occurs, the ovum becomes a foreign body, and is expelled accordingly. The outgrowth of syncytial masses causes a venous condition of the blood in the uterine sinuses, a condition which furnishes an ever-increasing peripheral stimulus to the centres in the cord. The growth of the fœtus, daily abstracting more oxygen from the mother, causes a daily increasing excess of CO_2 in the maternal blood, so furnishing the necessary stimulus for the medulla. All these are predisposing factors; and, ever increasing, apparently come to a climax at the tenth menstrual period. An exciting cause is furnished by some sudden movement—straining at stool, a violent cough, or the like; the period of unstable equilibrium comes to an end, and labour commences.

Stages.—Labour is divided into three stages :—

(1) The first stage, or stage of dilatation.
(2) The second stage, or stage of expulsion.
(3) The third stage, or placental stage.

The first stage commences with the onset of true labour pains, and lasts until the full dilatation of the os and the rupture of the membranes. Its average length is, in primiparæ, about eleven to twelve hours; in multiparæ, about six to eight hours. The second stage commences with the full dilatation of the os, and ends with the expulsion of the child. Its average duration is from one to two hours in primiparæ, and from ten to fifteen minutes in multiparæ. The third stage commences after the birth of the child, and

ends with the expulsion of the placenta. Its length varies greatly according as it ends spontaneously, or is ended artificially. If the expulsion of the placenta is left to the natural efforts, the average duration of this stage would be about three hours, but, if the usual method is adopted of expelling the placenta as soon as it is detached, the average duration is from twelve to fifteen minutes.

The Phenomena of Labour.

Before discussing the various phenomena of labour, we shall define certain terms which will be frequently used. These terms are as follows :—

Contraction.—By this term is meant the temporary shortening which occurs in a muscle-fibre in response to a stimulus conveyed to it by an efferent nerve.

Retraction.—By this term is meant the permanent shortening of the muscle-fibre which persists after the contraction has passed off.

Relaxation.—By this term is meant the condition of the muscle-fibre in the absence of contraction.

Polarity of the uterus.—By this term is meant the correlation which exists between the contractions of the fundus and of the cervix of the uterus. Prior to the onset of labour, the muscle-fibres of the body of the uterus are relaxed and those of the cervix contracted. After the onset of labour, the contraction of the muscle-fibres of the body are accompanied by a relaxation of the fibres of the cervix.

Uterine orifice.—This term is used to denote the passage which lies between the uterine cavity and the vagina at any stage of labour. At one time

this passage comprises the entire cervical canal, while at other times it only includes portions of the canal according to the amount of dilatation which has occurred.

The taking up of the cervix.—This is the term applied to the gradual process by which the cervical canal is made continuous with, and so part of, the lower uterine segment.

It will probably help the student to understand the phenomena of labour if we briefly summarise these phenomena in a short account of the process of labour. At the commencement of labour, the fœtus floats in the liquor amnii in a closed sac formed by the membranes, and this sac in turn is contained in another closed sac—the uterus. The connection between the sac formed by the membranes and the investing uterus is but slight, save at one point—where the placenta is attached to the uterine wall, and here large blood-vessels pass from the uterus into the placenta. In order that the fœtus may escape from the sac in which it is contained, the membranes must rupture, and, in order that it may pass out of the investing uterus, the cervical canal must dilate to a sufficient size to allow it to pass through. Further, a powerful force is necessary in order to expel the fœtus from the uterus, and to overcome the resistance which is offered to its passage by the maternal tissues. Finally, the placenta has to be detached and expelled from the uterus, and, as this occurs, some mechanism has to come into play which will obliterate the blood-vessels, and so prevent the hæmorrhage which would otherwise occur.

These various changes are brought about as follows:—With the commencement of labour intermittent contractions of the uterus occur, with the result that the ovum is compressed. The compressing force is greater above and at the sides, and least below, and, consequently, the ovum bulges downwards against the lower portion of the uterus. *Pari passu* with the intermittent contractions, the polarity of the uterus shows itself, and the fibres of the cervix relax. Then, as a result of the pressure of the ovum and of the relaxation of the cervical fibres, the uterine orifice slowly dilates. As soon as this dilatation has reached a stage sufficient to allow the head to pass through, the membranes tear, in consequence of the pressure transmitted to them from the uterine contractions, and of the loss of the previous support which they received from the lower pole of the uterus and the walls of the cervix. The first stage of labour is now said to be complete; the passage through which the fœtus is to pass is ready; and the second stage commences.

From this time on, the uterine contractions, instead of merely causing dilatation of the uterine orifice, begin to expel the fœtus from the uterus, and, in obedience to a natural impulse which calls on her to supplement them, the patient "bears down," or, in other words, she endeavours by means of the accessory muscles of labour—*i. e.* almost all the important voluntary muscles in her body—to increase the intra-abdominal pressure, and so to increase the force which is driving the fœtus out of the uterus. As a result of these forces, the fœtus is driven into the pelvis, where room has been in part already made

for it by the displacement upwards of certain of the pelvic structures—notably the bladder. As the fœtus descends, it makes more room for itself by driving the greater part of the remaining structures downwards before it. The relations of the bony pelvis also undergo certain alterations, which cause a temporary increase in various diameters. The presenting part then reaches the vulva, and, passing through the latter, is born, and is quickly followed by the rest of the body. With the birth of the fœtus, the second stage is completed.

The third or final stage of labour then commences, and consists of the expulsion of the remainder of the ovum—*i. e.* the placenta and the membranes. This process is again brought about by the contractions of the uterus, as a result of which the uterus diminishes so much in size that the placenta is detached, and is expelled from the uterine cavity, while as a result, not only of the contraction of the uterus, but still more of the retraction, the blood-vessels which run into the placenta are so compressed and kinked that any further hæmorrhage through them is prevented.

We thus see that the principal phenomenon of labour, to which almost all the other phenomena are due, is the occurrence of uterine contractions, helped by the contractions of the accessory muscles of labour.

The Contractions of the Uterus.—From an obstetrical point of view, the uterus is composed of three parts or zones :—

(1) *An Upper Zone—the Upper, or the Contractile, Uterine Segment.*—This zone contains that portion of the uterine muscle whose contractions effect the ex-

pulsion of the fœtus. It is composed of fibres which run in all directions, and is completely covered by firmly attached peritoneum.

(2) *A Lower Zone—the Lower, or Non-contractile, Uterine Segment.*—This zone lies between the upper uterine segment and the inner os. The junction between the upper and lower segments is termed the "retraction ring," and corresponds to the place at which the structure and arrangement of the muscle fibres of the upper segment end (*v.* Fig. 44). The muscle fibres of the lower zone are very loosely connected with one another, and run some circularly and others longitudinally. In accordance with the property of so-called polarity of the uterus, the circular fibres relax as the upper uterine segment contracts, while the longitudinal bands, by their contractions, draw the cervix upwards over the advancing ovum.

(3) *The Cervix.*—This zone comprises that portion of the uterus which lies below the inner os. It also contains circular fibres, which act similarly to those found in the lower segment.

Accordingly, we see that the uterus is a most complexly formed hollow muscle. During pregnancy the fibres are in a condition of relaxation, with the exception of the circular fibres of the cervix, and they are in tonic contraction. As soon as labour commences the condition is reversed. The fibres of the upper segment and the longitudinal fibres of the lower segment contract, and the circular fibres of the lower segment and of the cervix simultaneously relax.

The contractions of the uterus possess four

characteristics:—They are intermittent, peristaltic, involuntary, and painful.

At the commencement of labour contractions occur only at long intervals, a period of perhaps an hour elapsing between each. As the first stage proceeds, they become more frequent, and, on an average, occur every twenty minutes during the taking up of the cervix, and every two to three minutes during the dilatation of the uterine orifice. During the second stage they occur at first every five to ten minutes, and increase in frequency, until during the birth of the fœtus they are almost continuous. After delivery, the contractions, as a rule, cease for from five to fifteen minutes, and then recur every five minutes or so, until the placenta has been detached and expelled from the uterus. The duration of a contraction varies according to the stage of labour. At the commencement of labour a contraction lasts a few seconds, and gradually increases in duration until during the second stage it lasts from thirty to ninety seconds.

It is probable that the uterine contractions are peristaltic in character, but this has not been definitely determined, and, even those who believe in their peristaltic nature have not agreed upon the direction in which the wave travels. According to some, it commences at the cervix and passes upwards, but the more general opinion is that it commences in the region of the tubes and passes downwards towards the cervix.

The involuntary character of the contraction is common to all unstriped muscle fibre. The occurrence of contractions is, however, affected by psychical

influences, such as may arise from the presence of a stranger in the room, dread of pain, and such-like causes.

The painful nature of uterine contractions—a fact to which the term "pain" as applied to these contractions owes its origin—is one of their most marked characteristics. The pain occurs at the height of the contraction, which commences and ends painlessly. Its site, cause, and nature vary according to the period of labour. The preliminary pains—*dolores presagientes*—which usually usher in labour are very irregular in their occurrence, and are felt over the abdomen generally. They are not severe in character, and are probably due to the increased force of the hitherto painless uterine contractions and to commencing dilatation of the cervix. During the first stage of labour the pain is principally referred to the region of the sacrum, and to a slighter extent to the sides of the uterus. It is chiefly due to the stretching of the cervix, and to a less extent to the contractions of the uterus, and is of a dull and aching character. With the advent of the second stage, and the increase in the strength of the uterine contractions, the pain becomes more severe. It is felt in the uterus, due to the compression of nerves situated in the uterine wall; in the sacrum and pelvis generally, due to the stretching of the vagina and perinæum; and in the thighs and legs, due to pressure upon the sacral plexus. During this stage the pain grows in severity, and reaches a climax during the passage of the head over the perinæum, when it is described as being of a violent tearing or cutting character. During the third stage the

pains are felt principally in the uterus, and are probably due to the compression of the uterine nerves. As a rule they are not severe.

The round ligaments contract synchronously with the uterine muscle, of which they must be regarded as an extension. Their effect is to draw the uterus downwards, and so to counteract the tendency of the fundus to rise upwards.

The Contractions of the Accessory Muscles of Labour.—The accessory muscles, which come to the aid of the uterine muscle during the period of expulsion, consist of almost all the important voluntary muscles of the body. Primarily, they consist of those muscles which can aid in diminishing the size of the abdominal cavity; while secondarily, they consist of the muscles of the limbs, which, by fixing the thorax and pelvis, give to the other muscles a *point d'appui*. The effect of the contraction of the auxiliary muscles is to cause a uniform pressure over the body of the uterus, and so both to expel the uterine contents and also to drive the uterus as a whole downwards. This latter action is of importance, inasmuch as it tends to prevent the excessive thinning which might occur in the lower uterine segment if the upper segment was free to rise, as its tendency is, in the abdominal cavity.

The effect of the Uterine Contractions on the Uterus.—The first effect of the contractions on the uterus is to cause a considerable increase in pressure inside the cavity of the uterus. At the same time, the longitudinal diameters of the uterus are increased, owing to the expansion of the lower uterine segment, the transverse diameters are diminished, and the

wall is increased in thickness. If the contents of the uterus were compressible a diminution in the size of the cavity would result, but as they are incompressible an increase of the uterine pressure occurs, with the result that the ovum tends to bulge in whatever direction it is subjected to the least resistance. This area of least resistance is found in the neighbourhood of the os internum, a fact which is accounted for by the different arrangement of the muscle fibres, which are fewer at this part of the uterus than they are elsewhere; and, further, by uterine polarity, which causes these fibres to relax as the fundus contracts. The continuance of uterine contractions leads to the following important changes :—

(1) The taking up of the cervix.
(2) The dilatation of the uterine orifice.
(3) The expansion of the lower uterine segment.
(4) The diminution in size of the upper uterine segment.

(1) *The Taking Up of the Cervix.*—The taking up of the cervical canal into the lower uterine segment is a process which differs in detail and in degree in the case of primiparæ and multiparæ. In both cases, the mechanism by which it is accomplished is similar, and consists in the softening which has been progressively taking place in the cervical tissues during pregnancy; in the contractions of the longitudinal uterine fibres which draw up the cervix over the advancing ovum; and in the contractions of the upper uterine segment which drive the ovum downwards.

In primiparæ, at the commencement of labour, the cervix presents more or less its characteristic outline and length, and both the internal and external os are closed. The process of taking up closely resembles the effect which would be produced by pushing a

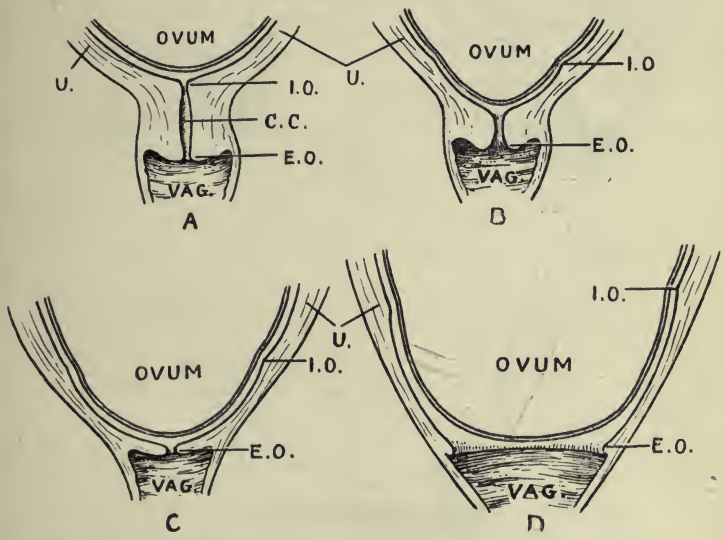


FIG. 42.—Diagrammatic representation of the manner in which the cervix is taken up in the case of a primipara. E.O. Os externum. I.O. Os internum. C.C. Cervical canal. U. Uterus.

cone through the cervical canal from above downwards (*v.* Fig. 42). First, the internal os dilates, and its outline is practically lost. Then the supra-vaginal portion of the cervical canal dilates in a similar manner, and then the infra-vaginal portion. The taking up of the cervix is now complete, the uterine and cervical cavities are continuous with one

another, and the uterine orifice is alone enclosed by the thinned-out edges of the external os.

In multiparæ, on the other hand, the cervix at

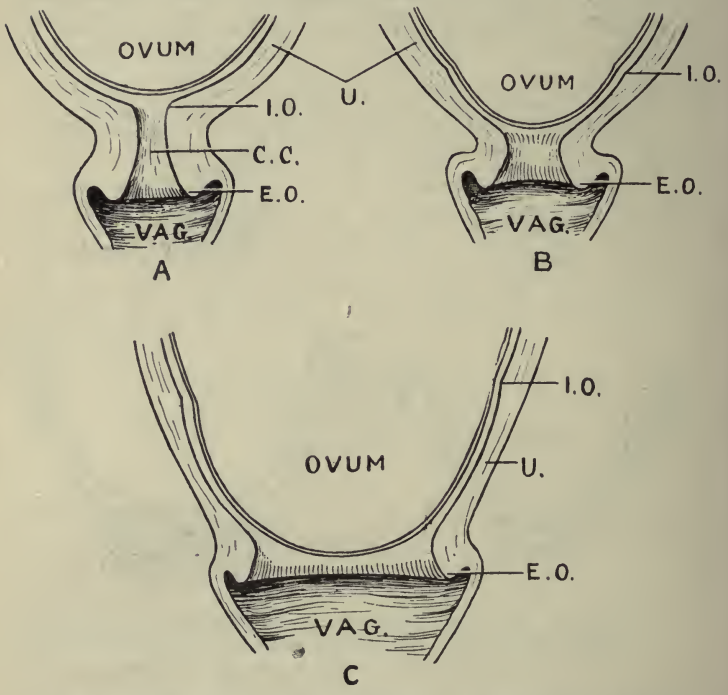


Fig. 43.—Diagrammatic representation of the manner in which the cervix is taken up in the case of a multipara. (The letters are the same as in Fig. 42.)

the commencement of labour has lost its original contour to a varying extent. The external os is already patulous, and will admit one or two fingers, so that whereas in primiparæ the upward passage of the examining finger is checked by the

resistance of the external os; in multiparæ it is checked by the resistance offered by the supra-vaginal portion of the cervix, or even by the internal os. This is probably due to the increased degree of softening which is present in these cases, and also to the effect of former lacerations of the cervix. In such cases the taking up of the cervix is not so complete as in primiparæ (*v.* Figs. 42, 43). The first step consists in the dilatation of the internal os, followed by the dilatation of the supra-vaginal portion of the cervical canal. The process of taking up is now complete, and the uterine orifice is enclosed by the greater part of the infra-vaginal portion of the cervix. Consequently, whereas in primiparæ the uterine orifice is encircled by the thin, almost paper-like, edges of the os externum, in multiparæ it is encircled by blunt, comparatively thick edges, formed by the lower half of the cervical tissues.

(2) *The dilatation of the uterine orifice.*—The dilatation of the uterine orifice is brought about by the distending pressure exerted on its edges by the descending ovum, and by the contractions of the longitudinal bands of muscle fibre, which draw the remaining portions of the cervix upwards. As soon as this upward retraction of the cervix is so complete that almost all trace of cervical projection has disappeared, dilatation is complete, and the utero-cervical and vaginal cavities are continuous. During the dilatation of the cervix, the cervical glands pour forth large quantities of mucus, which materially facilitates the expulsion of the fœtus by its lubricating effect on the walls of the genital canal.

(3) *The expansion of the lower uterine segment.*—The changes which take place in the lower uterine segment during labour are of the greatest practical importance. At the commencement of labour, the lower uterine segment comprises the zone between the retraction ring and the os internum, and is about $2\frac{3}{4}$ inches in depth. When the taking up of

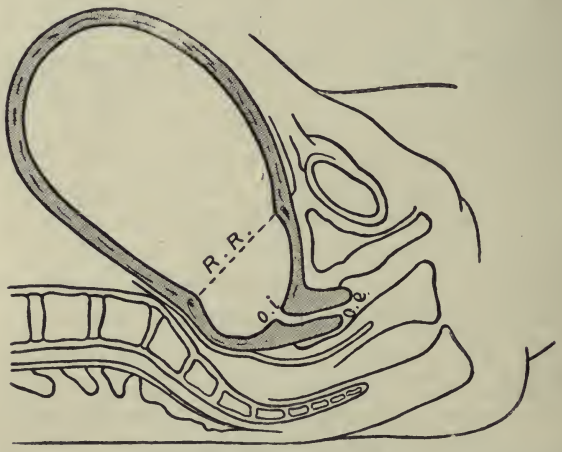


Fig. 44.—The position of the retraction ring at the commencement of labour. *R.R.* Retraction ring. *o.i.* Internal os. *o.e.* External os.

the cervix is complete, the lower uterine segment is increased in size by the added portion of the cervical tissues. Above the retraction ring, the uterine muscle contracts and retracts during labour. Below it, the muscle relaxes, with the exception of the longitudinal bands, which draw the cervix upwards. With each contraction of the uterus the capacity of the upper segment diminishes, while the capacity

of the lower segment increases owing to the descent of the ovum. The combined effect of these changes in the upper and lower segments is to produce an actual elongation of the uterus, which persists even after the head has passed completely into the pelvis.

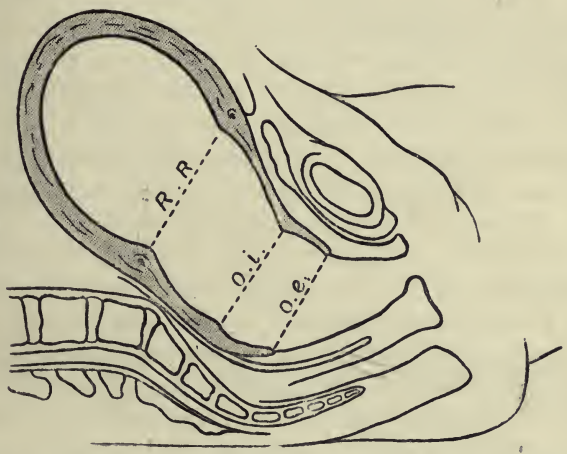


Fig. 45.—The position of the retraction ring after an unduly prolonged labour. *R.R.* Retraction ring. *o.i.* Internal os. *o.e.* External os.

At first the diminution in size of the upper segment occurs and passes off with each contraction; but, as labour continues and retraction becomes more marked, each contraction leaves the cavity of the upper segment slightly smaller than it was before. It is obvious that, so long as the fœtus is completely contained in the uterus, this gradual diminution in size of the upper segment must be accompanied by a corresponding increase in size in the lower segment. This increase, under normal circumstances, is obtained

by the taking up of the cervix, and as soon as this process is complete and the uterine orifice dilated, the advance of the fœtus renders further expansion unnecessary. If, however, there is any obstacle to the birth of the fœtus, then the progressive retraction of the upper segment necessitates an increased amount of expansion of the lower segment. The greater this obstacle is, and, consequently, the longer labour continues, the greater will be the increase in size of the lower segment, until, finally, if labour continues sufficiently long, the lower uterine segment becomes so thinned by expansion that it yields to the pressure of the fœtus, and a rupture of the uterus occurs (*v.* Fig. 167). In normal cases the retraction ring, *i. e.* the junction between the upper and lower uterine segments, is not apparent, but in cases of prolonged labour it may be felt through the abdominal walls as a depression running obliquely across the uterus, at first a little above the symphysis, and, finally, perhaps in the region of the umbilicus (*v.* page 59). Accordingly, we see that the position of the retraction ring, if it can be ascertained, affords important information as to the effect of the contractions on the uterine muscle fibre.

The functions of the lower uterine segment are two in number. In the first place, as will be readily understood, unless it existed the uterine contractions could not bring about the expulsion of the fœtus. If the entire uterus was composed of an identical arrangement of muscle fibre, the contraction of the latter would merely tend to compress the ovum. When, however, the lower segment of the uterus contains fibres which apparently act in

opposition to the fibres of the upper segment, and so provide a place into which the contractions of the latter can drive the ovum, its expulsion from the uterus is possible. Consequently, the first function of the lower segment is to facilitate the expulsion of the fœtus.

The second function of the lower uterine segment is to form a ring, which prevents the descent of the presenting part until the uterine orifice is sufficiently dilated to allow it to pass. Into this ring the presenting head is driven by each contraction in such a manner that the two together act as does a ball-valve. This action is very important. Prior to each contraction of the uterus, the liquor amnii which surrounds the body of the fœtus is in free communication with the liquor amnii which lies in front of the head. If this communication persisted during a contraction, the result would be that a quantity of liquor amnii would be forced in front of the head, and that, in consequence, the tension on the membranes lying over the dilating cervix would be so great that they would rupture long before the uterine orifice was fully dilated. Instead of this, however, each contraction drives the head so firmly into the embrace of the lower segment that all communication between the hind-waters and the fore-waters is temporarily shut off, and that, consequently, the tension on the membranes is only increased in proportion as the head descends. This ball-valve action is further of importance at the time the membranes rupture, inasmuch as it prevents the escape of the liquor amnii which surrounds the body of the fœtus. But for it, as soon as the membranes ruptured, the liquor

amnii would all flow away and, perhaps, carry down the cord.

(4) *Diminution in the size of the upper uterine segment.*—As we have already seen, contraction of the uterine muscle during labour results in a temporary diminution in size of the upper segment and the consequent expulsion of the fœtus, while retraction results in a permanent and progressive diminution, and the consequent adaptation of the uterus to its lessened contents. Accordingly, during the first and second stage, the uterine cavity becomes smaller as the fœtus is expelled, and its walls at the same time increase in thickness; during the third stage the cavity is only sufficiently large to contain the placenta; while, subsequent to the expulsion of the latter, the cavity is only potential. The effect on the uterine vessels, of the diminution which occurs after delivery, is obvious. During the period of a contraction, the uterine vessels are temporarily compressed and twisted, and, as a result of retraction, their permanent obliteration is effected. During the process of detachment of the placenta, however—that is, before retraction is complete—some loss of blood normally occurs. The average amount is said to be four ounces before the expulsion of the placenta, and six ounces with the placenta and membranes.

The Effect of the Uterine Contractions on the Pelvic Contents and Perinæum.—The manner in which the pelvic cavity is temporarily emptied of its contents, in order to afford room for the passage through it of the fœtal head, constitutes one of the most interesting phenomena of labour. The contents of the pelvis, as seen in antero-posterior section, are so

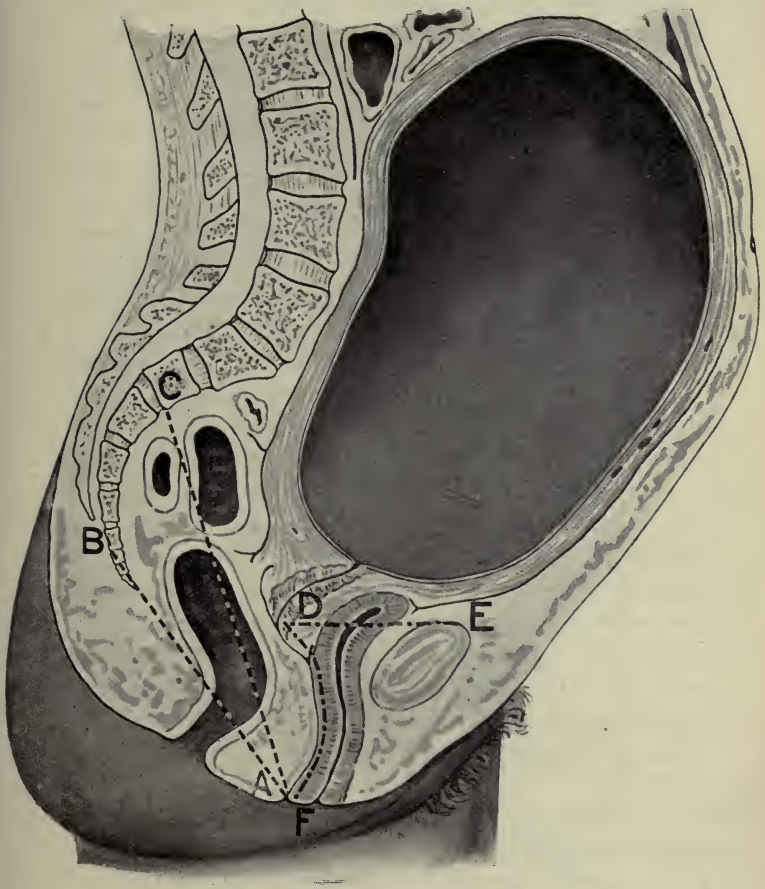


FIG. 46.—Median section of the pelvis and uterus just before labour. A, B, C. The posterior triangle which is pushed downwards in front of the advancing head. D, E, F. The anterior triangle which is in great part drawn upwards over the advancing head.

arranged as to form two triangles, separated from one another by the vaginal slit—an anterior and superior triangle, and a posterior and inferior triangle (*v.* Fig. 46). The structures contained in the anterior triangle are intimately connected with the cervical tissues, while the structures contained in the posterior triangle are quite independent of any uterine connections. As the cervix is drawn upwards by the contraction of the longitudinal bands of muscle fibre, it draws up with it the greater part of the structures in the anterior triangle. In this manner the bladder, which at the commencement of labour lay, if empty, entirely below the pelvic brim, is drawn up out of the pelvis into the abdomen. The structures in the anterior triangle, which are not connected with the cervix—*viz.*, the lower third of the vaginal wall and the urethra—are pushed downwards in front of the presenting part. As the presenting part descends it pushes before it the posterior triangle, which, as we have mentioned, is unaffected by the retraction of the cervix. In this manner the lower portion of the rectum, the perinæal body, and the muscles of the pelvic floor, are pushed downwards by the presenting part (*v.* Figs. 47, 48).

As the presenting part descends, it obstructs the return flow of blood in the veins, and the consequent rise in intra-venous pressure, aided by the natural hyperæmic condition of the vaginal mucous membrane, causes a serous transudation from the vessels into the peri-vaginal and perinæal tissues and on the surface of the vaginal mucous membrane. This transudation renders the tissues more distensile, and so capable of dilating to the necessary extent with-

out laceration. Further, by increasing the amount of vaginal discharge, it reduces the friction between

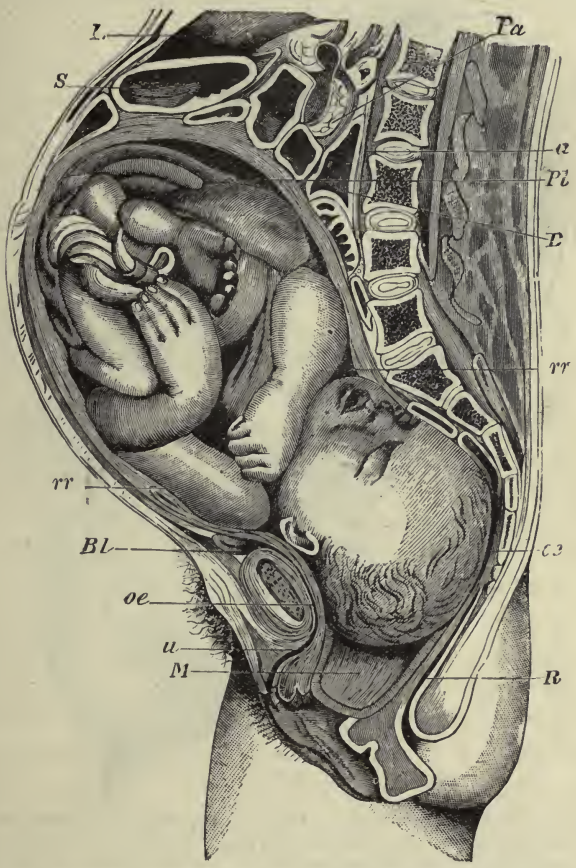


Fig. 47.—Frozen median section of a patient who died in labour at the end of the first stage. *L.* Liver. *S.* Stomach. *Pa.* Pancreas. *D.* Duodenum. *a.* Aorta. *Pl.* Placenta. *rr.* Retraction ring. *Bl.* Bladder. *oe.* Os externum. *u.* Urethra. *M.* Bag of membranes. *R.* Rectum. (*Braun.*)

the vaginal mucous membrane and the skin of the fœtus to a minimum.

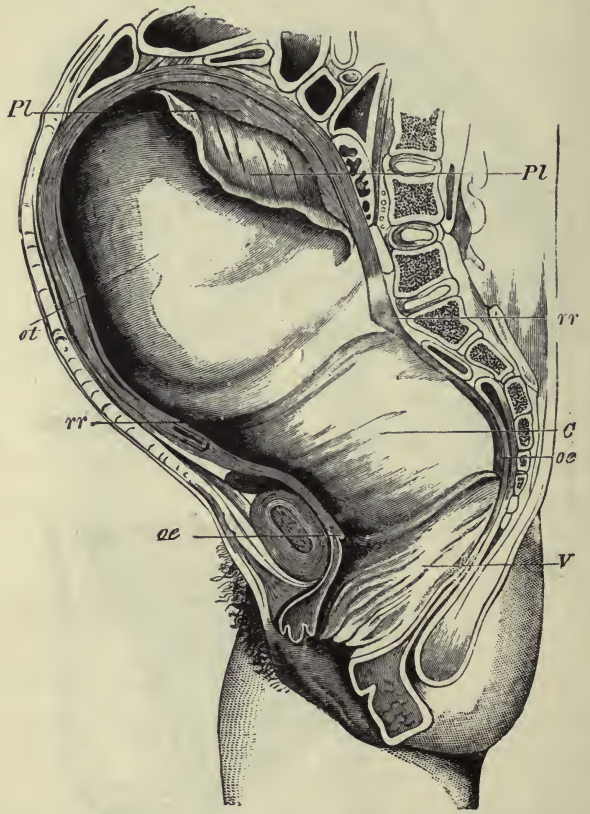


Fig. 48.—The same section as Fig. 47, the fœtus being removed. *Pl.* Placenta. *rr.* Retraction ring. *C.* The lower uterine segment and the cervical cavity. *oe.* Os externum. *V.* Vagina. This section shows also the condition of the pelvis after the removal of its contents as has been described. (*Braun.*)

The Effect of the Uterine Contractions on the Pelvic Joints and Ligaments.—All the cellular and connective

tissue of the pelvis becomes softened, œdematous, and hypertrophied during pregnancy. The various pelvic ligaments undergo a similar change, especially just prior to parturition. These changes enable an increased amount of movement to take place at the various joints, and the mobility of the sacrum especially is increased. The pressure of the fœtal head when passing the brim is thus enabled to drive the base of the sacrum backwards, increasing thereby the conjugate diameter of the brim and diminishing that of the outlet. Later, when the head has descended further, the lower portion of the bone is driven upwards and backwards, and the outlet is widened, while at the same time the promontory projects more prominently forwards. Even greater relaxation occurs at the symphysis pubis, and sometimes at the end of pregnancy the pubic bones can be made to move upon one another at this articulation. During labour the bones become slightly separated, and thus increase the size of the pelvic inlet.

The Effect of the Uterine Contractions on the Ovum.—As we have seen, the first effect of the uterine contractions on the ovum is to cause the latter to bulge in the direction of least resistance. At the same time, the lower uterine segment is drawn upwards over the ovum, and so there is a detachment, to a greater or less extent, of the membranes from the underlying decidua, a process which is accompanied by slight bleeding. This blood, mingled with the mucus which comes from the cervical glands, produces the so-called "show" which usually ushers in labour. Another result of this detachment of the membranes is the formation of the so-called "bag of

membranes," the term applied to that part of the membranes which are felt protruding through the uterine orifice during labour. No further change takes place in the ovum until the dilatation of the cervix is complete. Then, in consequence of the loss of support which the undilated portion of the cervix previously furnished, the membranes rupture, and

Fig. 49.—Diagram representing the effect of "general contents' pressure" after rupture of the membranes.

the liquor amnii, which constitutes the fore-waters, escapes.

The manner in which the force of the uterine contractions is transmitted to the fœtus varies according to the relation of the fœtus to the investing uterus. The contractions of the uterine muscle result in an increase in the intra-uterine pressure, and hence in the creation of a force which is sometimes termed the "*general intra-uterine pressure*" or the "*general contents' pressure.*" If the fœtus is floating in the liquor amnii, the membranes being un-

ruptured and the presenting part still unfixed, this force acts as a general and uniform pressure over all parts of the fœtus, and consequently does not tend to alter the position of the latter. If, however, the presenting part is fixed in the pelvis, and is of such a nature that it can completely fill the lower uterine segment, then the contraction of the longitudinal bands of muscle fibres draws the lower segment upwards until there is a girdle of contact all round between it and the presenting head. As soon as this occurs, the hind-waters are shut off from the fore-waters and the "general intra-uterine pressure" is only transmitted to the fœtal body and such part of the head as is above this girdle of contact. The result is that a force equal to the general intra-uterine pressure acts on the part of the head which is above the girdle of contact, and tends to drive it downwards. This force acts uniformly over the base of the head, and consequently does not tend to alter the relation of the head to the body, but solely to drive the head directly downwards.

When, however, the liquor amnii has in part escaped and the uterine wall is in contact with the fœtal body, a direct uterine pressure on the body results, and another force, which, from its tendency to restore the uterus to its original form, is known as "*form-restitution force*," comes into play. The circular fibres of the uterus contracting strongly, cause a diminution in its tranverse and antero-posterior diameters, and so exert a lateral pressure upon the fœtus. This pressure tends to straighten the fœtal body and brings about an actual increase in length of about an inch and a quarter. This brings the

fundal pole of the fœtus into contact with the fundus of the uterus, with the result that the contractions of the longitudinal fibres cause a force which acts directly downwards on the fundal pole. The resultant of these two forces—the circular force, which straightens the fœtal body, and the downward force, which acts on its fundal pole—is a force termed "*fœtal axis pressure*," which acts directly down the

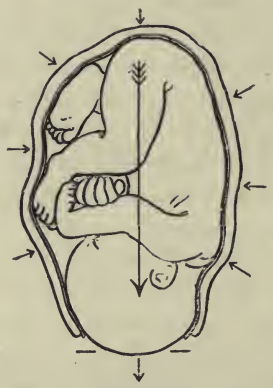


Fig. 50.—Diagram representing "fœtal axis pressure."

body of the fœtus and is transmitted to the head through the spinal column. This force, therefore, does not act uniformly over the base of the head, and consequently is capable of producing a change in the relation between the head and the trunk.

As soon as the membranes have ruptured, the contractions of the uterus drive the fœtus downwards. When the presenting part reaches the pelvic floor it lies on the levator ani muscle, which is supported in turn by the perinæum. As each

contraction occurs, it is driven downwards a little, and, in its descent, forces downwards and forwards both of these structures. Then, as the contraction passes off, the presenting part again recedes, forced upwards by the resisting levator ani muscle. This procedure recurs several times, each time the presenting part coming a little lower than the time before, but each time slipping back again into its former position. Finally, however, there comes a contraction of sufficient strength to drive the presenting part between the lateral division of the muscle in such a manner that the latter grips the part above its greatest convexity, and consequently is enabled to hold it in this position. As soon as this occurs the head no longer recedes, but remains in the position into which it was driven by the contraction. The next contraction then is able to drive it out, and during this process the maximum distension of the perinæum occurs. The remainder of the liquor amnii accompanies and follows the birth of the fœtus.

The various alterations in the position and the attitude of the fœtus which occur during its expulsion are termed "the mechanism of labour," and, as they differ according to the presentation of the fœtus, they will be discussed in the chapters on the various presentations.

In addition to these alterations, changes take place in the shape of the fœtal head as a result of the pressure it undergoes in its passage through the pelvis. These changes are known as the moulding of the head, and result in a diminution of those diameters which are most compressed with a compensatory elongation of those which are not com-

pressed. As has been already shown, the moulding of the head is rendered possible by the presence of the sutures and fontanelles. The precise nature of the changes which occur differs according to the presentation, and will be referred to in its proper place. Speaking generally, however, it may be said that one parietal bone slides under the other, and that the frontal and occipital bones slide under the parietal bones. The cartilage between the squamous and temporal portions of the petrous bone acts as a hinge, and so allows the former portion to be pressed inwards.

Another change which takes place is the formation of the "*caput succedaneum*," the term applied to the sero-sanguineous swelling which forms on the unprotected area of the presenting part—*i. e.* the area corresponding to the uterine orifice – in consequence of the pressure to which the remainder of the body is subjected. The caput succedaneum is formed by a transudation of lymph from the vessels into the tissues of the scalp, with a little added blood due to minute hæmorrhages, the result of the laceration of small vessels. Its size depends upon the duration of labour and the strength of the uterine contractions. The site of the caput varies according to the nature of the presentation and the position of the fœtus, and its exact site also changes during labour according as the presenting part flexes, extends, and rotates. The caput succedaneum usually disappears completely in from twenty-four to forty-eight hours after birth. In cases in which it forms on the face, marked temporary disfigurement often results, owing to distortion of the features, and may cause the parents considerable anxiety. It is, however, only temporary.

The contractions of the uterus return shortly after the birth of the fœtus, and cause the detachment and the expulsion of the placenta and the decidua. The exact mechanism by which these processes are effected cannot be regarded as clearly ascertained. The most obvious and commonly accepted theory is that of Schultze. He considered that the placenta was first detached in consequence of the shrinkage which occurs in the placental site as the uterus contracts down after the birth of the fœtus; that blood escaped from the uterine vessels into the retro-placental space thus formed, completed the detachment, and at the same time drove the placenta downwards into the membranes with its fœtal surface lying lowest; and that the contractions of the uterus, acting on this hæmatoma, completed the expulsion of the placenta from the upper segment of the uterus. Matthews Duncan, on the other hand, considered that the placenta, after its detachment, was expelled from the uterus with its lower border first, and that it passed through the retraction ring as a button passes through a button-hole.

Schultze's theory appears the most obvious, save in cases in which the placenta extends almost or quite into the lower uterine segment. In such cases a hæmatoma in all probability does not form, or, if it forms, the accumulated blood escapes before there is enough to influence the attachment or position of the placenta, and the placenta is probably wholly detached by a slip of the uterine wall upon it. It is probable that, in these cases, Matthews Duncan's mechanism of expulsion occurs.

The Symptoms of Labour.

The symptoms of the patient during labour must be considered under two headings :—

(A) The symptoms of normal labour.

(B) The symptoms of prolonged labour.

(A) **Symptoms of Normal Labour.**—The symptoms of the patient at the commencement of the first stage are very slight, and she may be able to follow her usual occupations, save when a pain occurs. As the stage advances, the pains become more frequent, and last longer. The pulse and temperature remain normal, save for a slight quickening of the former during a pain. At the end of the second stage, and just prior to the rupture of the membranes, vomiting very commonly occurs.

The symptoms of the second stage are more marked than are those of the first, since the increased strength of the uterine contractions and the descent of the fœtus into the vagina add to the patient's sufferings. The pulse-rate is considerably increased during a contraction, and the rate of respiration is similarly increased immediately after the contraction has passed off. The temperature is often raised from half a degree to a degree. As the fœtus descends and presses upon the rectum, the patient experiences a strong desire to go to stool.

After the birth of the child there is a marked amelioration in the symptoms, so that the patient lies in a restful and contented condition. The temperature usually is at first slightly higher than during the previous stages, while the pulse-rate falls. The uterine contractions return from five to

fifteen minutes after the birth of the child, and then recur every few minutes until the placenta is expelled from the uterus. These contractions do not, however, cause any great degree of discomfort to the patient.

(B) **Symptoms of Prolonged Labour.**—It is of extreme importance to recognise the symptoms of unduly prolonged labour as soon as they appear, as serious consequences may occur owing to the patient being allowed to remain too long undelivered.

The earliest indication that labour is unduly prolonged is afforded by the pulse-rate and the temperature; and, of the two, the former is the more important. The pulse increases in frequency, and from a rate of 70 to 80 beats per minute, it may attain a rate of anything from 100 to 160 beats. The occurrence of a rise of temperature is not so constant, and does not admit of quite the same interpretation. It usually implies that a slight septic infection of the patient has occurred, due to the decomposition of liquor amnii in the vagina, a condition which, of course, is indirectly the result of the prolonged labour.

The next indication to appear is a change in the character of the uterine contractions. The exact change that takes place differs according to the cause of the prolongation of the labour. If the prolongation is due to some obstruction to delivery, the contractions become more frequent, more violent, and more painful, and finally, losing their intermittent character altogether, become tonic or continuous. As a result of this, the abdomen of the patient becomes extremely tender, and the uterine walls

become so firm that it is impossible to palpate satisfactorily the fœtal parts. If, however, the prolongation of labour is due to weakness of the contractions or of the voluntary efforts of the patient—a condition which may be primary, or may be the result of long continued efforts to overcome an obstruction, the contractions, instead of becoming stronger, gradually die away, and may entirely disappear. In some cases, they return again after the patient has rested; in other cases, a condition of "missed labour" results, and a dead fœtus is retained in the uterus.

While these changes in the character of the pains are taking place the appearance of the patient also alters. Her face is drawn and anxious and expressive of the degree of intensity of the suffering which she has undergone. Her lips become dry, and sordes accumulate about them. The tongue becomes dry and coated, and nausea and vomiting may occur.

The remaining symptoms of prolonged labour are as follows:—

(1) The rising of the retraction ring to a height of more than an inch and a half above the symphysis (*v.* page 132).
(2) Ballooning of the upper part of the vagina, the result of the retraction of the cervix.
(3) Dryness of the vagina, due to the failure of the cervical secretions.
(4) Standing out of the round ligaments, the left of which, as a rule, alone is felt (*v.* page 60).

The Diagnosis of Labour.

It is often a difficult question to recognise whether

or not the patient has entered upon the first stage of labour. Later, when she is having strong labour pains, there is no difficulty in making a diagnosis. Also, in many cases, we may say definitely that the patient is not in labour at the moment of examination, but still we are unable to say that she will not be in labour within the next hour. Frequently such patients are sent out of a hospital in the morning obviously not in labour, and return the same evening, perhaps as a case of street delivery.

To decide the question, a careful examination of the patient must be made. Begin by palpating the abdomen, and notice if the presenting part is fixed, and if the uterus contracts intermittently. The fixity of the head is a tolerably reliable guide in multiparæ, but is of no value in primiparæ. In the former, as a rule, the head does not become fixed until the onset of labour; in the latter it is fixed for the last three or four weeks of pregnancy. There are several conditions which prevent the head from fixing at its proper time, and so cause exceptions to this rule. These are, speaking generally, anything which either offers an obstruction to the descent of the head, or causes a disproportion between the size of the latter and the size of the brim or cavity (*v.* page 56). In the absence of these exceptions, the rule given above may be relied on; and, if we find the head not fixed in the case of a multipara, probably she is not in labour, and *vice versâ*. If uterine contractions can be felt, find out if the patient complains of pain during them,—that is if the contractions are painful or painless. The presence of painless contractions

may be taken as a sure indication that she is not in labour, of painful contractions that she is.

A vaginal examination must next be made, with a view to discovering whether the cervix is dilating or not. If it is only slightly dilated, the patient may not be in labour. One frequently finds in the case of multiparæ, an external os the size of sixpence a considerable time before labour has set in. In primiparæ, however, the external os does not dilate until the patient has been for some time in labour.

There is one other point of slight importance, namely, the occurrence of the so-called "show," a blood-stained mucous discharge that comes from the cervix and vulvar glands for one or two days before labour sets in. It has been already discussed (*v.* page 141).

The determination as to whether the patient is in the first or second stage, can usually be made by noting the character of the labour pains. In the first stage, the latter are solely uterine contractions, but in the second stage voluntary bearing-down efforts are added. Further, the history of the patient, or a vaginal examination, informs us if the membranes have ruptured or not, and so at once settles the question.

CHAPTER VIII.

CEPHALIC PRESENTATIONS.

Vertex Presentation: Definition, Frequency, Ætiology, Positions, Diagnosis, Mechanism, Abnormal Mechanism, Moulding.

The term cephalic presentation includes all forms of head presentation (*v.* page 41).

VERTEX PRESENTATION.

Definition.—A vertex presentation is the term applied to that presentation in which the head presents, and the vertex, or space between the anterior and posterior fontanelles, lies lowest (*v.* Fig. 52).

Frequency.—Vertex presentation is said to occur in about 95·53 per cent. of all full-term cases. At the Rotunda Hospital, amongst 24,818 cases of labour occurring after the commencement of the fourth month, vertex presentations occurred in 93·46 per cent. In this number, fontanelle presentations are included.

Ætiology.—The ætiology of vertex presentation has been already discussed under the heading of "Presentations" (*v.* page 39).

Positions.—Four positions are recognised, according as the back of the fœtus lies to the left or right of

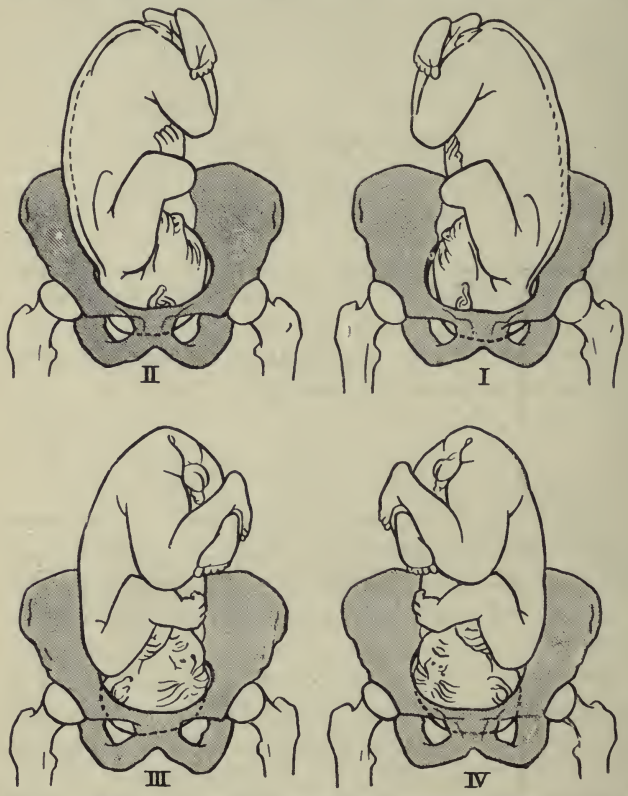


Fig. 51.—The four positions in which the fœtus may lie in vertex presentation.

the middle line, and is turned forwards or backwards. They are :—

1st position—back to the left and in front.

2nd position—back to the right and in front.

3rd position—back to the right and behind.

4th position—back to the left and behind.

The first position is very much the most common, and the next most frequent is the third position. The second and fourth positions are rarely found (*r.* page 44).

Fig. 52.—Vertex presentation. The fœtus as felt by abdominal palpation after flexion has occurred. (*Farabeuf.*)

Diagnosis.—**Abdominal Palpation.**—The diagnosis of vertex presentation is best made by this means. The head is found in the lower uterine segment, and either just above the pelvic brim or engaged in it. The chin lies at a higher level in the uterus than the occiput, thus denoting that the case is one of

vertex, and not of brow or face presentation (*v.* Fig. 15). The breech is at the fundus, and between it and the head lies the body, usually inclined to one or other side. The limbs may or may not be felt, according as the back is posterior or anterior.

The position of the fœtus is ascertained by noting whether the back is turned to the left or to the right, and anteriorly or posteriorly (*v.* Fig. 51).

Vaginal Examination.—A hard rounded tumour is

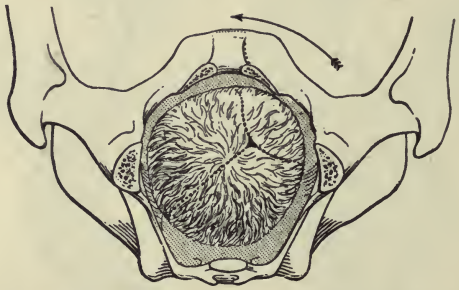


Fig. 53.—Vertex presentation. The fœtal head as felt from below. The arrow shows the direction in which internal rotation takes place. (*Farabeuf.*)

found to be presenting, and upon it the sutures and fontanelles are felt (*v.* Fig. 54). The anterior fontanelle is recognised by its lozenge-like shape; the posterior is smaller and triangular. If, however, the bones overlap one another, owing to moulding, the fontanelles may be obliterated. Their site can then be recognised by the fact that a number of sutures meet at a point. At the anterior fontanelle, four sutures meet; at the posterior, three.

The position of the fœtus is ascertained by noting the situation of the fontanelles and sutures relatively

to one another and to the pelvis. Thus, in a first position, the posterior fontanelle lies to the left of the anterior fontanelle and in relation to the anterior wall of the pelvis. In the second position, the posterior fontanelle lies to the right of the anterior fontanelle and in relation to the anterior wall of the pelvis. The third position is the reverse of the first position, and the fourth of the second (*v.* Fig. 52).

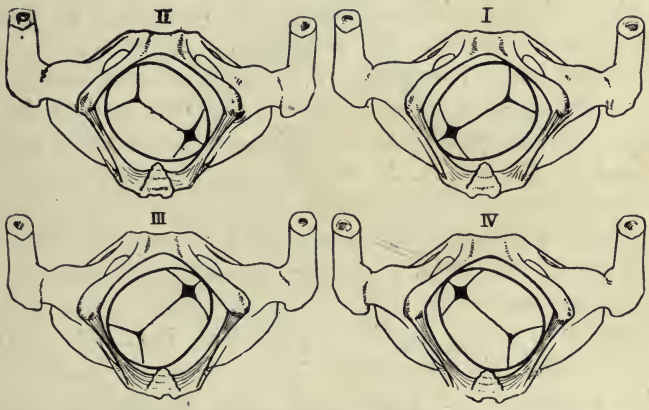


Fig. 54.—The four positions of the fœtal head in vertex presentation, as felt from below.

Auscultation.—The point of maximum intensity of the heart-sounds is found below the umbilicus, and to one or other side of the middle line according to the side at which the back lies.

Mechanism.—The movements by which the fœtus is adapted to the varying diameters of the genital canal can be resolved into five distinct groups :—

(1) Descent; and coincidently,

(2) Flexion.

(3) Internal rotation.
(4) Extension.
(5) External rotation.

(1) **Descent.**—As the uterus contracts, the presenting head, if it is not already fixed, is driven down into the brim of the pelvis under the influences of the forces to which we have already referred (*v.* page 142). It enters the brim in such a manner that its bi-parietal diameter is parallel to one or other of the oblique diameters, according to the position in which the child lies. As a rule both parietal bones pass through the brim simultaneously, and the sagittal suture bisects the true conjugate. This is known as the *synclitic* engagement of the head (*r.* Fig. 63). As will be seen presently, under certain circumstances the parietal bone which is in relation to the symphysis may pass through the brim before its fellow (*v.* Fig. 64); or, on the other hand, the parietal bone which is in relation to the promontory may be in advance (*v.* Fig. 65). In such cases the mode of engagement is said to be *asynclitic* (*v.* page 169). In describing the mechanism of labour here, we shall suppose that the fœtus lies in the first position. In that position, the head enters the brim with its bi-parietal diameter parallel to the left oblique diameter of the brim, and in a position of partial flexion in consequence of the normal intra-uterine attitude of the fœtus.

(2) **Flexion.**—The second act in the mechanism of labour is the completion of flexion of the head (*v.* Fig. 52). The engaging diameter at the commencement of labour is one between the sub-occipito-breg-

matic and the occipito-frontal diameters, and the vertex is the presenting part. As the head passes through the brim, the degree of flexion present increases. Two results follow from this—the sub-occipito-bregmatic diameter becomes the engaging diameter, and the posterior fontanelle becomes the presenting point (*v.* Fig. 55). The cause of flexion

Fig. 55.—Vertex presentation. First position, with back in front. Head advancing through upper part of pelvic cavity in position of flexion.

depends upon the nature of the force which is acting upon the fœtus. We have seen that two forces may act upon the fœtus :—one, the general contents pressure acting equally over the base of the skull; the other the fœtal axis pressure acting along the axis of the fœtus, and transmitted to the head, at first through the vertebral column.

Flexion resulting from general uterine pressure

alone is due to the shape of the head. As we have mentioned, this pressure acts as a uniform force over the base of the skull, and so, if the resistance to the descent of the head was equal on all sides, would cause a simultaneous descent of all parts of the head. Owing to the pre-existing partial flexion of the head, the occiput where it meets with the resistance of the brim is comparatively sheer, and consequently slips readily past the brim. The sinciput, on the other hand, is more prominent and tends even to project slightly beyond the margin of the brim, and in consequence, there is more or less resistance to its descent according as the head is large or small in comparison with the pelvis. In normal cases, where the antero-posterior engaging diameter has almost sufficient room to pass easily through the oblique diameter, the pre-existing degree of flexion is but slightly increased. When, however, the oblique diameter of the brim is narrowed, and when, consequently, considerable obstruction is offered to the engaging diameter of the head, flexion is exaggerated, and, in such cases, may proceed so far that the occipital bone constitutes the presenting part. This excessive flexion of the head is known as Rœderer's obliquity.

The manner in which fœtal axis pressure causes flexion is simple. The first effect of the uterine contractions, after the liquor amnii has in great part escaped, is to straighten out the previously curved fœtal body. Then, the force of the contraction is transmitted to the breech, and constitutes a force acting downwards through the axis of the fœtal body. This force is at first transmitted to the head through

the occipital condyles, and consequently acts on the base of the skull at a point nearer the occiput than the sinciput. Accordingly, the occiput is driven down until the chin comes into contact with the chest. This process will be readily understood by reference to the accompanying diagram (*v.* Fig. 56). The fœtal axis pressure acting along a line DE acts on the

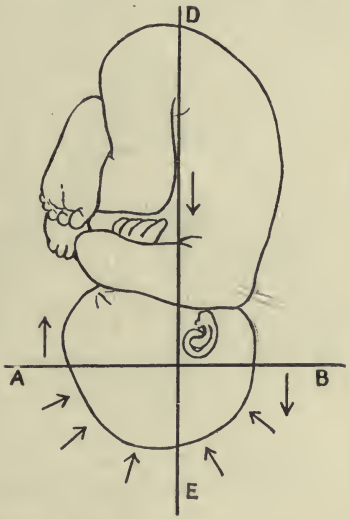


Fig. 56.—Diagram showing how flexion is produced.

engaging plane AB of the head at a point nearer the occiput than the sinciput. Consequently, the occipital end of the plane will be driven down more rapidly than the anterior end.

(3) **Internal Rotation.**—When flexion has occurred, the head is advancing with the posterior fontanelle lying lowest and the sub-occipito-bregmatic diameter lying in the right oblique diameter of the pelvis

(*v.* Fig. 57). The head continues in this position until the presenting part reaches the pelvic floor, when the occurrence of internal rotation brings the sub-occipito-bregmatic diameter to lie in the antero-posterior diameter of the outlet (*v.* Fig. 58).

The causes of internal rotation are the shape of the fœtal head, and the alteration which takes place from above downwards in the length of the diameters

Fig. 57.—Vertex presentation. Head advancing through lower part of pelvic cavity. Internal rotation just commencing.

of the pelvis. At the pelvic brim, the oblique and transverse diameters are greater than the conjugate; but, at the outlet, the antero-posterior diameter is the greater. Consequently, as there is a natural tendency for the large engaging diameters of the head to adapt themselves to the large diameters of the pelvis, the head rotates as it descends in such a manner as to bring those diameters which were in the oblique diameter of the pelvis into the antero-posterior

diameter. The shape of the pelvis and the resistance offered by the perinæum and vaginal walls are also important factors in the production of internal rotation. The inner surface of the ischium resembles a portion of a helix of such a curve that if a rounded body, such as the fœtal head, is driven downwards through the pelvis with sufficient force, and if, at the same time, it is kept in close apposition with this inner surface or anterior inclined plane of the ischium, it will be gently guided forwards until its lowest portion comes to lie in the pubic arch. This tendency to forward rotation is increased by the fact that there is less resistance to the advance of the presenting part under the pubic arch than elsewhere, since the resistance of the vaginal walls and perinæum obstructs its descent posteriorly. It is thus seen that the movement of internal rotation is, in fact, identical with the turning of a screw in its socket, the fœtal head forming the screw, the genital canal the socket. The length of the turn depends upon the position of the lowest portion of the presenting part—*i. e.* in the case of a vertex presentation the region round the posterior fontanelle. If the fœtus lies with its back anteriorly —that is, with the occiput at the anterior extremity of either oblique diameter then internal rotation takes place through one-eighth of a circle. If, on the other hand, the occiput is in relation to the posterior end of the oblique diameter, internal rotation takes place through three-eighths of a circle. It may be considered to be a definite law governing internal rotation that whatever part of the presentation is lowest will rotate to the front. In a vertex presentation under normal circumstances, the occipital

end of the head is the lowest, and consequently it rotates forwards. If, as sometimes happens, the sinciput lies lowest, then internal rotation takes place in the opposite direction, and the forehead is rotated forwards.

(4) **Extension.**—When internal rotation is complete the head is lying so that its sub-occipito-bregmatic diameter corresponds approximately to the antero-posterior diameter of the outlet, and the

Fig. 58.—Vertex presentation. Head at outlet, internal rotation complete, extension just commencing.

occipital bone is under the pubic arch. Now the advancing head has to travel in a different direction from that in which it started, in order to suit itself to the forward curve of the genital canal. During the movements of internal rotation, the head has been adapting itself to this curve, and now it advances along it, and at the same time is delivered, by a movement of extension. In this stage, the occiput of the child becomes fixed beneath the pubic arch, and the head, as it extends, rotates round this

fixed point, in such a manner that the chin leaves the chest, and the face slowly appears from above the perinæum.

The cause of extension is very simple. The forces which act on the head of the fœtus are the driving force of the uterus and the resistance of the perinæum and of the muscles of the pelvic floor, and their resultant is a force acting along a line

Fig. 59.—The pelvis as seen from above showing the levator ani muscle. (*Norris.*)

which is directed forwards and slightly downwards. In order that the head may move in this direction extension must take place. The active contractions of the levator ani muscle supplement the passive resistance of the other structures of the pelvic floor, and assist in driving the head forwards. When the muscle is in an uncontracted condition it forms the concave sides of a kind of gutter or groove, in which, during a part of the stage of expulsion, the fœtal head lies. When the muscle contracts, this groove

becomes shallower, and so pushes forward anything which may be lying in it.

(5) **External Rotation.**—This, the final movement of the head, consists of two parts—(*a*) restitution, (*b*) external rotation. During internal rotation, the head becomes slightly twisted as regards the shoulders, and this position continues so long as the head is subjected to the pressure of the pelvis. As soon as

Fig. 60.—Vertex presentation. The head is born and restitution has occurred. The shoulders lie in the left oblique diameter of the pelvis, and external rotation is just commencing.

the head is freed from this pressure, its first movement is to rotate, so as to resume its normal relationship to the shoulders, *i. e.* restitution occurs (*v.* Fig. 60). As the head travelled through the pelvis, the shoulders became engaged in the brim in the oblique diameter at right angles to that in which the head engaged. Thus, in a first position, the shoulders engage in the left oblique diameter of the pelvis. As they descend, the anterior shoulder, being slightly lower than the posterior one, rotates in front, and the

shoulders lie in the antero-posterior diameter of the pelvis. It is this movement that causes the completion of external rotation, the already delivered head rotating to suit the new position of the shoulders (*v.* Fig. 61). Usually, the head rotates in such a manner as to return to its former position; *i. e.* in a first position, it rotates with the occiput pointing to the mother's left thigh, in a second position, with the occiput pointing towards the right thigh.

Fig. 61.—Vertex presentation. Internal rotation of shoulders and external rotation of head are complete.

When the anterior shoulder has rotated in front, it becomes fixed under the pubic arch. The posterior shoulder then sweeps over the perinæum, and is born. The trunk follows, with the arms folded upon the chest. The hips undergo a similar rotation to the shoulders, and are born with their bi-trochanteric diameter in the antero-posterior diameter of the outlet. Finally, the lower limbs appear.

It is interesting to note that the different movements in the mechanism of labour are, so to speak,

complementary to one another. Thus, first occurs flexion of the head; then, internal rotation; then, extension, the complement of flexion; then, external rotation, the complement of internal rotation.

In the second position the head engages with its bi-parietal diameter in the right oblique diameter of the pelvis. Flexion, internal rotation, and extension occur as before. The shoulders engage in the right oblique diameter of the pelvis, and, as a consequence of the anterior rotation of the left shoulder, the occiput turns towards the mother's right thigh.

In the third position the mechanism of delivery is similar to that of the second position, save that the head enters the brim with its bi-parietal diameter in the left oblique diameter of the pelvis, and that, during internal rotation, the head rotates through three-eighths of a circle instead of through one-eighth. This is due to the fact that the occiput has to travel to the front from the posterior end of the right oblique diameter, instead of from the anterior end of the left oblique diameter.

In the fourth position the only differences from the first position consist in the head entering the brim with its bi-parietal diameter in the right oblique diameter of the pelvis, and in internal rotation taking place through three-eighths of a circle instead of through one-eighth.

Abnormal mechanism.—**Persistent Occipito-posterior Position.**—In some cases of vertex presentation, the forehead, and not the occiput, rotates to the front. This movement is due to incomplete flexion of the head, which causes the forehead to lie at a lower level than the occiput. Accordingly, following the

rule that the part of the child which first impinges on the pelvic floor rotates in front, forward rotation of the forehead occurs (*v.* Fig. 62). Then, the latter is fixed below the pubes, and the head is born by a slight movement of flexion instead of extension. The result of this condition is, that labour is very much more tedious than is usual, and during the birth of the head the perinæum is over-distended and frequently lacerated.

Fig. 62.—Occipito-posterior position of vertex.

Asynclitic Engagement.—Instead of the head entering the brim with the two parietal bones on the same level, one parietal bone may lie lower than its fellow. If the head is deflected towards the promontory, so that the anterior parietal bone lies lowest, we speak of posterior asynclitism (*v.* Fig. 64); if it is deflected towards the symphysis, so that the posterior parietal bone lies lowest, of anterior asynclitism (*v.* Fig. 65). These conditions will be referred to separately.

Posterior Asynclitism.—Posterior asynclitism, an-

terior parietal presentation, and Naegele's obliquity, are the terms applied to the presentation when the head is inclined toward one or other shoulder in such a manner that the sagittal suture approaches the promontory of the sacrum, and the anterior parietal bone lies lowest.

Posterior asynclitism is the rule in a flat pelvis, and also in a generally contracted and flat pelvis.

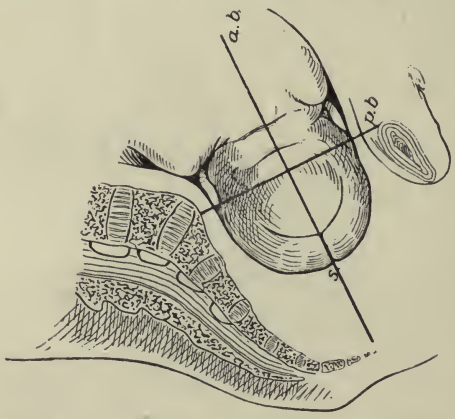


Fig. 63.—Synclitic engagement of head.

It is brought about by the obstruction offered to the descent of the posterior parietal bone by the projecting promontory of the sacrum. The greater the degree of flattening of the pelvis the greater this obstruction, and the nearer the sagittal suture approaches the promontory. Consequently, it is said that the distance between the sagittal suture and the promontory affords an indication of the degree of contraction of the pelvis (Litzman). If the contraction is very great, the head becomes so much

inclined that the sagittal suture may rise above the promontory, and the ear present.

Posterior asynclitism also occurs if the abdomen is very pendulous, as the oblique position of the fœtus brings the anterior parietal bone lowest.

As the head descends, the posterior parietal bone is arrested by the promontory ; the result is that the head rotates on its antero-posterior axis, so that the

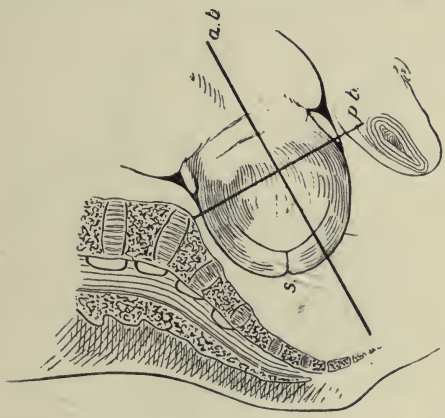


FIG. 64.—Posterior asynclitism of head. Anterior parietal bone presenting. *a.b.* Axis of brim. *pb.* Plane of brim. *s.* Sagittal suture.

anterior parietal bone descends and the sagittal suture approaches the promontory. At the same time the anterior fontanelle descends, and the eminence on the anterior parietal bone passes the brim. If the obstruction is not too great, the anterior parietal bone becomes fixed behind the symphysis, and, the head rotating round this fixed point in the opposite direction to its former rotation, the posterior parietal bone squeezes itself past the pro-

montory, and so the large diameters of the head come through the brim.

Anterior Asynclitism.—Anterior asynclitism, posterior parietal presentation, and reversed Naegele's obliquity, are the terms applied to the presentation when the head lies in such a position that the sagittal suture approaches the symphysis pubis and the posterior parietal bone lies lowest.

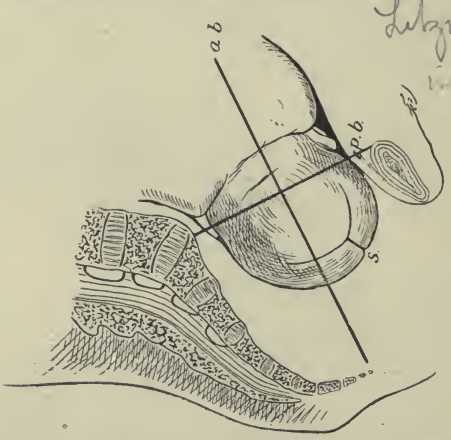


Fig. 65.—Anterior asynclitism of head. - Posterior parietal bone presenting. (Letters as in Fig. 64.)

The exact cause of posterior parietal presentation is unknown, but, presumably, increased obstruction offered to the descent of the anterior parietal bone by the symphysis has something to do with its occurrence. This presentation is met with both in contracted and normal pelves. In the normal pelvis the presentation probably occurs when the axis of the pregnant uterus lies behind the line of the axis of the pelvic brim (Herman). In such a case, the

anterior parietal bone would be driven more against the symphysis than is usual, and so its descent retarded. Anterior asynclitism may also occur as a consequence of latero-flexion of the fœtus, in which the head is displaced forwards over the symphysis. Such a latero-flexion may be the result of a tumour

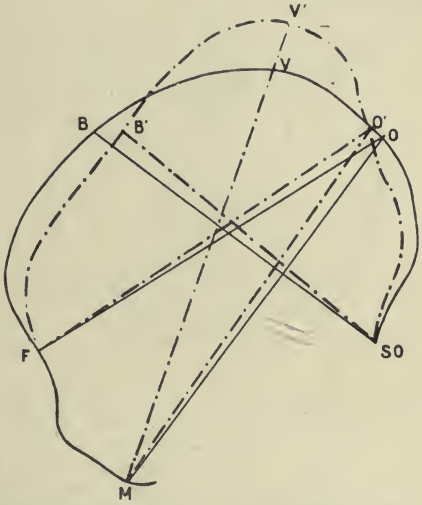


Fig. 66.—Vertex presentation. The moulding of the fœtal head. The dotted outline shows the shape of the moulded head, the firm outline of the unmoulded head. (*Budin.*)

on the posterior wall of the uterus, or of a hand prolapsed below the head (*v.* Fig. 158).

In the rare cases in which the head comes through the brim in this presentation, the following mechanism is said to occur :—"The pains drive down the anterior parietal bone, and, as it descends, the posterior lying parietal bone moves up, and then, first the anterior parietal eminence passes the brim, then the

posterior. Sometimes the side of the head opposite the promontory remains fixed, and the head rotates round this point as—when it is in the anterior parietal position—it rotates round the symphysis. But this

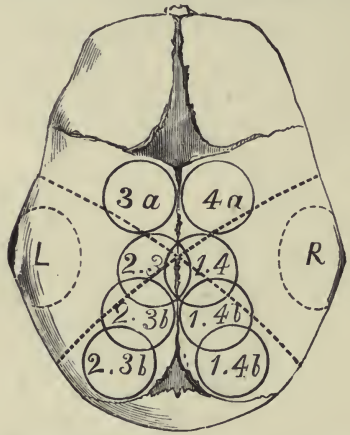


Fig. 67.—Diagram showing position of centre of caput succedaneum in the several positions of the vertex. 1.4, 1.4*b*, 1.4*b*, successive positions of centre of caput succedaneum in the first position of the vertex, and in the fourth position in which forward rotation has occurred. 2.3, 2.3*b*, 2.3*b*, successive positions of centre of caput succedaneum in the second position of the vertex, and in the third position in which forward rotation has occurred. 3*a*, position of centre of caput succedaneum in third position in which forward rotation has not occurred. 4*a*, position of centre of caput succedaneum in fourth position in which forward rotation has not occurred. (*Galabin* after *Tyler Smith.*)

only happens when the fœtal head is small and soft, so that it becomes indented instead of moving up."—(Herman.)

Moulding.—In vertex presentations the occipito-frontal, sub-occipito-bregmatic, and bi-parietal diameters of the fœtal skull are diminished; while the supra-

occipito-mental diameter is increased. The effects these changes produce on the shape of the head, are shown in the figure (*v.* Fig. 66).

The caput succedaneum forms at first near the coronal suture and over the right or left parietal bone according as the fœtus lies in the first or second position. As the head descends, the caput moves backwards along the sagittal suture until it lies close to or slightly over the posterior fontanelle (*v.* Fig. 67).

CHAPTER IX.

THE MANAGEMENT OF NORMAL LABOUR.

Definition of Normal Labour—Preparations for—Obstetrical Couch — Obstetrical Armamentarium — Management of Normal Labour, First Stage, Second Stage—Methods of preserving the Perinæum—Care of the Funis after the Birth of the Head —Management of the Third Stage—Ligation of the Cord—Expulsion of the Placenta—"The Dublin Method"—Method of determining whether the Placenta is in the Uterus or in the Vagina—Ergot—Anæsthesia.

Definition.—Normal labour consists in the child presenting by its vertex, in the pains coming on, and following one another, in such a manner, that the child is born and labour is ended without artificial aid or any complications within twenty-four hours. This happens in about ninety per cent. of all labours, and therefore it is very important to study the phenomena and management of normal labour, as it is in the management of normal labour that by far the greater number of mistakes are made. By ignorance or improper interference, cases of normal labour are turned into abnormal labour.

Preparation for labour.—During the last fortnight of pregnancy, the patient should pay particular attention to certain points. She should have a warm bath daily, and her bowels should be so regulated

as to avoid the constipation which is especially prone to occur towards the end of pregnancy. As soon as the premonitory symptoms of labour are noticed, a purgative must be administered—castor oil (one to two ounces), sulphate of magnesia (half an ounce), or liquid extract of cascara sagrada (one to two drachms), followed after a few hours by an enema. Another enema must be given soon after labour has begun.

It is always necessary to instruct a primipara as to what she requires to have in readiness for her delivery. The following list will be found fairly complete :—two mackintoshes, one large enough to protect completely the mattress, the other about one-third that size; four binders $1\frac{1}{4}$ yards long, and 18 inches wide; half a dozen packets of sanitary towels; half an ounce of surgical pins; one skein of glazed linen thread; and one pound of absorbent gamgee tissue, to use as sponges. Various materials are used for making binders—stout calico or linen, a material known as crashe, or ordinary roller towelling. Whatever material is chosen the binders should be washed prior to use, in order to make them softer and more pliable. The linen thread is used for tying the cord. It should be cut into lengths of twelve inches, doubled, and the ends knotted together. It must be boiled or soaked in corrosive sublimate lotion for a few hours prior to use, to sterilise it.

The following articles must be provided for the infant :—A square of flannel or an old blanket for receiving the child at birth; several pieces of soft old linen for wiping the eyes, mouth, etc., and antiseptic wool for dressing the cord; a little vaseline

or lanoline; an ounce of dusting powder (equal parts of boracic acid and starch); a piece of pure infant's soap; a small Turkish sponge. The last must not be used for the infant until the vernix caseosa has been removed, and for the first washing it is preferable to use a piece of cotton-wool or old linen, which can be burnt afterwards. A suitable supply of clothing for the infant must also be provided, but it is unnecessary to enter into a description of this.

It is also of importance to know how the obstetrical couch is made. It making it, we require to combine comfort with cleanliness and convenience. The patient must not be, as our grandmothers were, lost at the bottom of a large feather bed; neither must she be forced to lie on a hard board. A firm and well-made hair mattress will meet every requirement; it should, if possible, have boards beneath it instead of springs, and the bedstead should be about two feet in height. The bed is made in the following manner, from below upwards:—(1) the mattress; (2) the large mackintosh; (3) an under blanket; (4) a sheet and bolster; (5) the small mackintosh enclosed in the drawsheet; (6) a pillow; (7) a top sheet and the requisite number of blankets. There should be a piece of oil-cloth or mackintosh hanging as a valance at the side of the bed, in order to protect the latter.

The other essentials in the room are,—a fire, unless the weather is extremely warm, and it should, if possible, be one on which a kettle can be boiled; a large jug thoroughly scoured inside and outside, to hold about one and a half gallons; a stand of some kind on which it can be placed, and which will raise

it about two feet above the patient's bed; two additional jugs, one for cold and one for hot water; three or preferably four basins; an abundant supply of boiling and of cold water; a feeding-cup; a small bath; a piece of oil-cloth to protect the floor.

The obstetrical armamentarium—And now of what must the doctor's armament consist? We shall first mention the things necessary for a normal case, and then give a list of everything that will be required for any operation short of abdominal section. For a normal case he requires:—

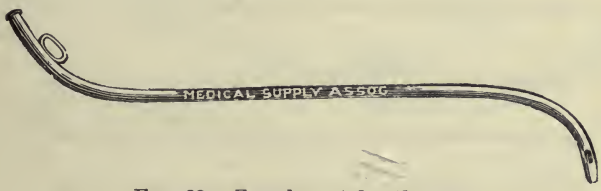


Fig. 68.—Female metal catheter.

(1) Corrosive sublimate tablets.
(2) Creolin or lysol.
(3) Carbolic soap.
(4) A good nail-brush.
(5) A metal catheter (*v.* Fig. 68).
(6) Higginson's syringe for administering enemata.
(7) A pair of strong scissors.
(8) Some preparation of ergot.

Any mention of a douche for douching the vagina or uterus is intentionally omitted in this list as in normal labour douching of any kind is unnecessary.

In order to be prepared for almost all obstetrical

emergencies save pubiotomy and abdominal section, the following in addition are required:—

(1) A syphon douche and glass nozzle. The best kind consists of a plain rubber tube, about six feet in length, without valves of any kind. At one end it has got a sinker which keeps it immersed in the fluid used; a little further up, the tube is encased in a moveable horseshoe-shaped guard of vulcanite, which fits over the edge of the jug and prevents the

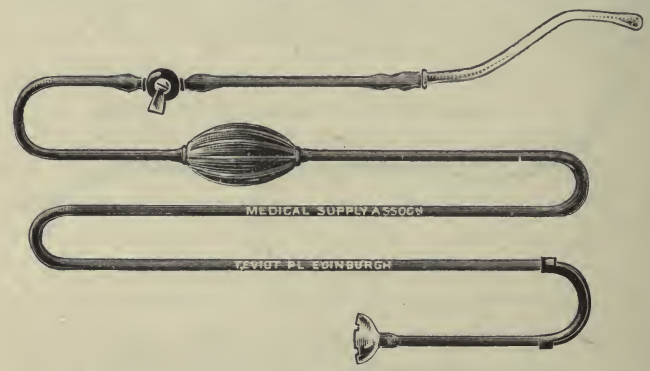


Fig. 69.—Syphon douche, as described in the text.

tube from kinking. Halfway down the tube there is a ball-shaped expansion, and a little further on there may or may not be a tap. It is completed at the other end by a glass nozzle. To use the douche the sinker is immersed in the fluid, and the vulcanite guard adapted to the depth of the jug, which is then placed upon the stand. Now compress the ball with one hand, and having done so squeeze the tube between the nozzle and the ball. By this means, when the ball is released, water is drawn into it from the jug. This usually is sufficient,

and the water will continue to run, upon the principle of a syphon. If it does not run, it is only necessary to repeat the previous manipulation a second time (*v.* Fig. 69).

(2) A needle-holder, and some large and a few small curved needles (*v.* Figs. 169, 170).

(3) An axis-traction forceps (*v.* Fig. 178).

(4) A male catheter, No. 3, for removing mucus from the child's larynx.

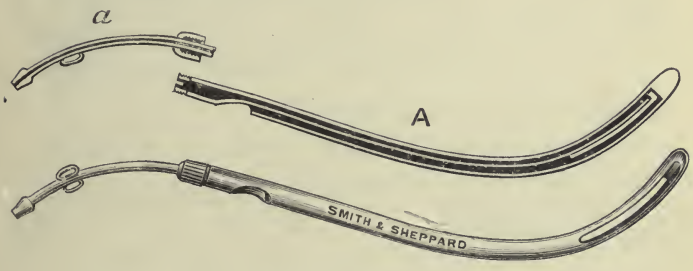


FIG. 70.—Bozemann's return catheter, as modified by Gibson.

(5) Two Bozemann's uterine catheters, one large and one small (*v.* Fig. 70).

(6) A perforator—Naegele's or Simpson's (*v.* Fig. 189).

(7) Braun's hook for decapitation (*v.* Fig. 194).

(8) A cranioclast—Braun's, or Winter's modification of Auvard's (*v.* Fig. 190).

(9) Frommer's modification of Bossi's dilator.

(10) A long and narrow forceps for plugging the uterus (*v.* Fig. 163).

(11) Two American bullet forceps (*v.* Fig. 71).

(12) A posterior speculum (*v.* Fig. 72).

(13) Two or three curettes, including Rheinstädter's (*v.* Fig. 129).

(14) A pair of long-handled and strong scissors (*v.* Fig. 195).

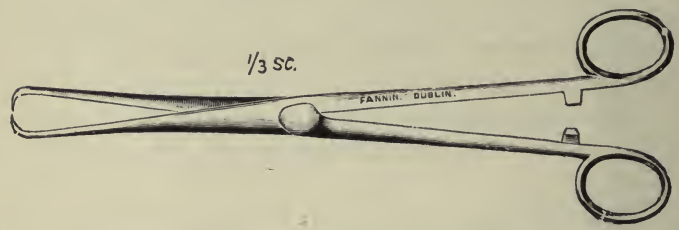


Fig. 71.—American forceps.

(15) Aseptic silk and catgut.

(16) Chloroform and inhaler.

(17) Iodoform gauze for plugging.

(18) A box of absorbent cotton wool for the same purpose.

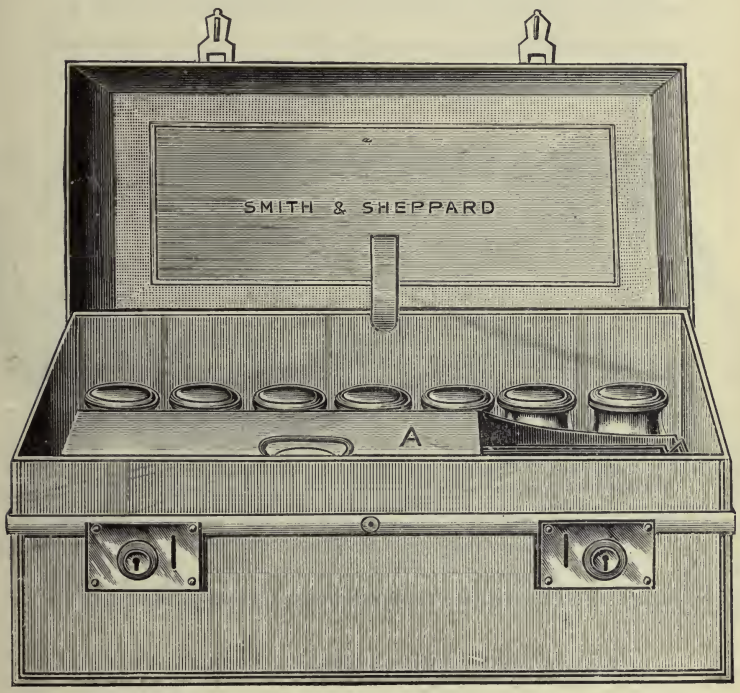
(19) Two gum-elastic catheters, Nos. 10—12, to act as repositors in the case of a prolapsed cord.

Fig. 72.—Posterior speculum.

(20) A hypodermic syringe.

(21) The following drugs are required:—Tincture of opium for administration by the mouth or in an enema, and ether, sulphate of strychnine, and morphia, for hypodermic injection.

In addition to these instruments it is very advisable to carry a suitably devised steriliser, in which the necessary instruments can be boiled.



ABOUT $\frac{1}{4}$ SCALE

Fig. 73.—The author's midwifery case. A. The steriliser. The tray has been removed.

The pattern we recommend is shown in Fig. 75. It is a steriliser which we have modified slightly from one originally suggested by Salisbury-Sharpe. If this apparatus is placed horizontally it forms a sterilizer, which can be placed on an ordinary fire

or gas-stove. The tray which it contains can be removed when sterilisation is complete, and be used as an instrument tray. When the apparatus is placed vertically it forms a douche-can, to the bottom of which a rubber tube can be attached (*v.* Fig. 76). A portable douche-stand has been

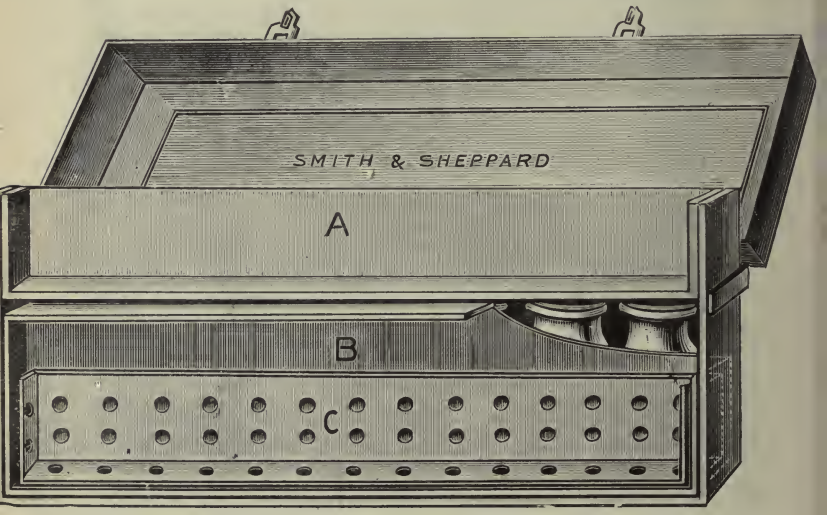


FIG. 74.—The author's midwifery case seen in section, showing the positions of, A, the tray; B, the steriliser; and C, the perforated instrument tray.

devised by Pasley, which can be fitted to the rail of the bedstead and from which the can may be hung (*v.* Fig. 77).

Such a steriliser cannot be carried in an ordinary midwifery bag, as its shape is not suitable. A bag, however, in spite of its popularity, is not a convenient means of carrying obstetrical instruments, as

it does not hold as much as does a properly devised case of the same size. We use a case similar to that shown in Figs. 73, 74. Along one side of the bottom of this case is a space for the steriliser, and along the other side are spaces for bottles which contain drugs and ligatures. The upper part of the case contains a tray in which all instruments are kept. Gloves, mackintosh apron or sterilised coat, and the portable douche-stand can be placed inside the steriliser. The latter also provides a convenient place in which to bring home dirty instruments,

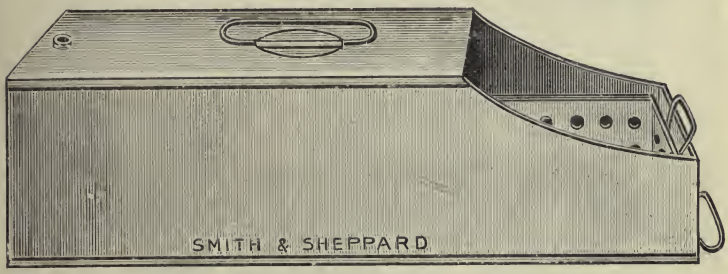


Fig. 75.—Sharpe's steriliser, as modified by the author.

etc., after use, as it prevents them coming into contact with, and soiling the other contents of the case.

Management.—The management of the three stages of labour must be considered separately.

First Stage.—The first stage commences with the onset of labour pains, and ends with the full dilatation of the os and the rupture of the membranes. Its chief physiological phenomenon is the occurrence of intermittent contractions of the uterus, which tend to drive the ovum into, and so to dilate, the cervical canal. Its management consists in maintaining the patient's strength, in helping nature in

a natural way, and in avoiding meddlesome and dangerous interference.

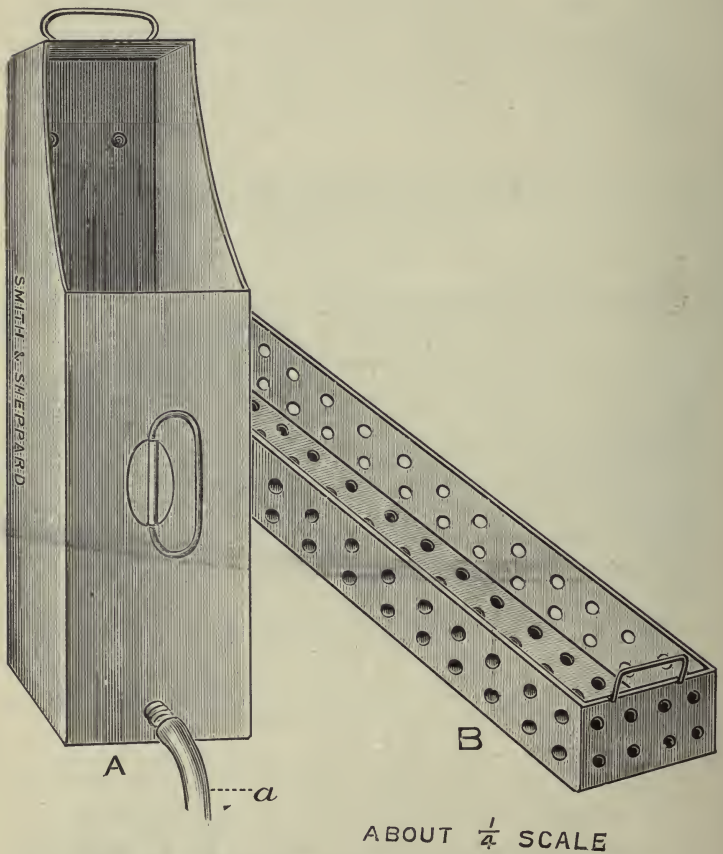


FIG. 76.—Sharpe's steriliser, ready for use as a douche can. A, Douche can. *a*, Rubber tube. B, Perforated instrument tray.

Concerning the first of these it is unnecessary to say much. The patient must get easily digested

food at short intervals, and anything likely to derange the stomach must be avoided. At the commencement of labour, when the pains are few and far between, she should have some occupation which will keep her mind off her condition, and so prevent fretting.

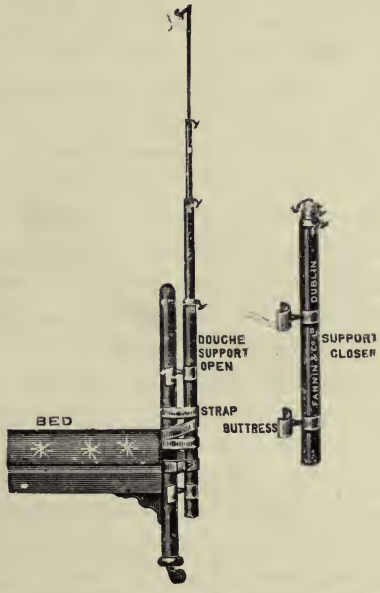


Fig. 77.—Pasley's portable douche stand.

The second indication—to help nature in a natural way—is easily carried out. We can help nature to dilate the cervix, by keeping the woman in such a position that the action of gravity aids the pains in driving the ovum downwards against the os; in other words, by allowing the patient to

walk about or sit in a chair, and not compelling her to remain in bed. Indeed, instinct will prompt her to maintain an upright posture. Moreover, the uterus must be in such a position that its contractions can act to the greatest advantage. If the abdomen is pendulous, or if any degree of lateral obliquity of the uterus is present, the contractions will drive the head, not into the pelvic cavity, but against the brim. Such obliquity, or anteversion, of the uterus is best corrected by applying tightly an abdominal belt or binder, so as to keep the uterus in a proper position; also by making the patient lie on the side to which the head is deflected, or upon her back in case of marked anteversion. Another important point is to remove all obstruction to the descent of the head. In a normal case the only obstructions present are a full bladder or a loaded rectum. To avoid the former, the patient must be made to pass water frequently; or, if necessary, a catheter must be passed. To insure that the rectum is empty during the second stage a purgative should be given as soon as the premonitory symptoms of labour appear, followed in a few hours by a soap-and-water enema. It is well to repeat the latter as soon as the labour passes into the second stage, to avoid the soiling caused by fæces being forced out by the descending head. It is useless to make the patient "bear down," *i. e.* voluntarily contract her abdominal muscles, during the first stage. As soon as voluntary efforts have any effect, that is, as soon as the os is dilated, she will "bear down" of her own accord. Premature efforts only waste her strength, and make

but slight impression upon the cervix, inasmuch as they tend to drive the entire uterus and its contents into the pelvis, and not to force the ovum against the cervix. Indeed, by the absence or presence of voluntary bearing-down efforts, we can tell whether the patient is in the first or second stage, without making a vaginal examination.

The third indication is to avoid meddlesome and dangerous interference. This includes unnecessary vaginal examinations; manual or instrumental dilatation of the os; the application of the forceps, when it is not only unnecessary, but contra-indicated; and prophylactic vaginal douching, when it is not required (*v.* page 5). The advantages of abdominal palpation over vaginal examination, and the dangers of the latter have been already mentioned. One vaginal examination, however, is necessary, in order to determine if the cord is presenting or prolapsed. It should be made, if possible, just after the membranes have ruptured. In cases in which the head has been fixed for some time before labour, even this examination is unnecessary.

Second Stage.—The second stage commences with the full dilatation of the os, and ends with the birth of the child. Its chief physiological phenomena are the continuance of involuntary and intermittent uterine contractions with the added help of the voluntary contractions of the abdominal muscles, the diaphragm, and, indeed, of most of the muscles of the body. The results of these contractions are:—first, that the membranes rupture, having lost the support of the cervix; and secondly, that the fœtus advances downwards through the vagina, presses

on and distends the perinæum, and finally is born. The indications for the management of the case are the same as before, until the head appears at the vulva. As, however, the phenomena have changed, so the manner of carrying out the indications changes also; and we endeavour to help nature in a different way from the method adopted in the first stage. As the os is fully dilated, and as voluntary "bearing-down" efforts are now occurring, we must put the patient in such a position that she can make the best use of her strength. This she can do best in bed. Let the patient lie on her side, with her feet against the end of the bed, and give her something on which she can pull. A towel tied to the foot of the bed is best, as, by pulling on it, she can counterbalance the force with which she is straining against the end of the bed. At the same time encourage her to hold her breath during a pain, and to "bear down" with all her strength.

As soon as the head appears at the vulva, the treatment becomes more active; and the obstetrician prepares for the immediate delivery of the patient. The chief indications are to obtain the slow delivery of the head, and to ensure that the smallest possible diameter distends the perinæum. There are two positions in which the patient may be placed; she may lie either upon her left side or upon her back. Of these, the former is preferable. It is cleaner, the progress of the head can be more satisfactorily watched, and more effectual measures can be taken for the preservation of the perinæum. Having the patient, then, in the side position, what method shall we adopt to prevent laceration of the perinæum?

Two chief methods have been proposed,—the direct and the indirect. The direct method consists in directly supporting the perinæum with the hand, with the object of preventing it from becoming over-distended, and lacerated. It consists in laying the palm of the hand on the perinæum, with the concavity between the first finger and thumb directed so as to enclose the posterior end of the vulva, and so preventing the perinæum from being forced downwards by the advancing head, and at the same time directing the pressure so as to push the head forwards beneath the pubic arch. The indirect method consists in endeavouring to push the head forward without any attempt being made to support the perinæum. This can be done either by introducing two fingers into the rectum, or, better still, by applying the "heel" of the hand behind the anus, and pushing the head forward. We shall describe the latter method in full, as it is perhaps the best of all methods for the preservation of the perinæum. To understand it clearly, it will be a help to study the accompanying diagram (*v.* Fig. 78).

The rod A B represents the fœtal body which is being driven downwards by the uterine contractions in the direction shown by the arrow C. This direction causes the head to press upon the perinæum H. If the end A of the rod can be pushed forwards towards A′, then the uterine contractions will drive the rod in the direction shown by the arrow C′, that is through the vulva. Accordingly, any pressure applied in the direction of the arrow H will take a proportionate amount of pressure off the perinæum.

One point must be remembered:—the parturient

canal is in the shape of a curve, with the concavity forwards. This curve may be considered as consisting of an upper segment and a lower segment. While the fœtus is advancing in the upper segment of the curve, it is being driven in the direction of a point midway between the anus and the tip of the coccyx. As it comes into the lower segment, it changes its direction, and moves towards the vulva. If forward pressure is applied to the advancing

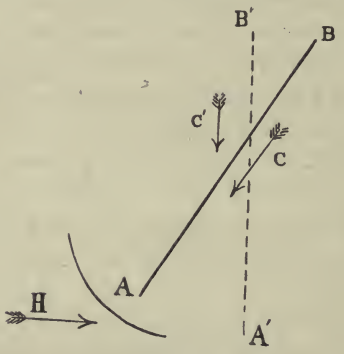


Fig. 78

head, while it is still in the upper segment of the curve, such pressure will drive it back into the uterus. If, however, we wait until the head gets into the lower segment, then forward pressure will push the head off the perinæum and in the direction of the vulva. Accordingly, this pressure can only be of use when the head has passed the "sticking point," if we may call it so,—that is the point of junction of the two portions of the parturient curve. This is the theory of the method, which is carried out as follows:—The patient is in the side

position, with her buttocks well over the edge of the bed. The obstetrician stands by her side facing the foot of the bed, and passes his left hand over the patient's hips, and then between the thighs from the front. With this hand he endeavours by apply-

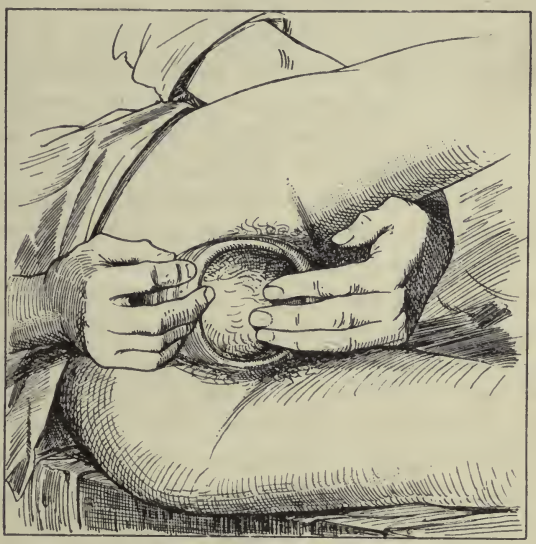


Fig. 79.—The head in the act of being born. The heel of the right hand, applied between the anus and the tip of the coccyx, presses the head forwards, whilst the fingers of the left hand endeavour to draw it forwards. The perinæum itself is not pressed on in any way.

ing his fingers to the scalp to draw forward the advancing head. Of course this cannot be done, effectually, until the head is sufficiently advanced to be able to get some purchase upon it with the fingers. Meanwhile, the right hand is idle, waiting until the head is sufficiently low for forward pressure

to be of avail. Then the heel of the hand is applied between the anus and the tip of the coccyx, and the head is pushed forward and delivered at a suitable moment, *i. e.* between the pains (*v.* Fig. 79).

There are two details, the due observance of which aids in the preservation of the perinæum. First, the head must not be allowed to extend too soon. Extension should be delayed until the lowest possible point of the occiput comes to lie under the symphysis; as the nearer to the neck is the point of the occiput round which the head rotates, the smaller will be the sagittal diameter of the head that will distend the perinæum. This is carried out by so pressing the forehead and face forward as to keep the chin in contact with the chest. The correct method of doing this can only be learnt by experience. The second detail is to deliver the head between the pains and not during a pain. This is done by trying to check the voluntary efforts of the woman at expulsion; by making her cry out instead of holding her breath; and by taking away the support of her feet, and any towel or rope upon which she may be pulling. Then, when the pain has passed off, the head may be pressed out as already mentioned.

The moment the head is born, we must determine whether the cord is twisted round the neck or not. This is done by passing a finger or two into the vagina, and feeling carefully round the neck and upwards as far as the shoulder. If the cord is there, it is readily felt, and must be immediately set free. The danger of leaving it is, that, if it is a short cord, or if it is several times round the neck, it

may not be sufficiently long to permit of the birth of the child without the detachment of the placenta. It can be set free in one of three ways. The usual and easiest method is to pull down a loop of it, and pass this loop over the head of the child; if there is a second turn round the neck, it must be set free in a similar manner. If the cord is drawn so tightly round the neck that it cannot be slipped over the head, we try to slip it over the shoulders. To do this, firm pressure is applied to the fundus, and the child driven downwards; as it advances, the cord is slipped, first, over one shoulder, and then over the other, and so the child is expelled through the loop of the cord. If neither of these methods are successful, owing to the excessive tightness of the cord, divide the latter with scissors, and deliver the child instantly, by means of pressure upon the fundus, and traction upon the head.

While the cord is being set free, the nurse should wipe carefully the eyes of the child, to remove any discharge that may have got into them during the passage of the head through the vagina. This is an important prophylactic measure in the treatment of the purulent ophthalmia of infants.

When the cord has been set free, the remainder of the delivery may be left to nature, provided that the cord is still pulsating; if not, the child must be instantly delivered. In accomplishing this, avoid undue or premature traction on the head, as it may hinder rotation of the shoulders. *Vis a tergo* is much to be preferred to *vis a fronte*. Therefore press upon the fundus, and, as the shoulders come down, lift the child upwards towards the mother's

abdomen, so as to allow the posterior shoulder to sweep over the perinæum. Then depress the body again slightly, in order to bring the anterior shoulder from beneath the symphysis. Once the shoulders are born the rest of the child quickly follows, as it is smaller than the part which has gone before.

In persistent occipito-posterior positions, the patient should lie upon the side at which the occiput is, as this is said to favour its anterior rotation. Also pressure may be made on the sinciput with two fingers in the vagina in order to favour the descent of the occiput. Some writers advise one to pass the hand into the vagina and rotate the head. Such a procedure is rarely required, and, indeed, is but seldom possible unless the head is small. If delivery in such a case is long delayed, the forceps may be applied, but if possible it is better to avoid their use, as the risk of causing extensive perinæal laceration in these cases is considerable.

In the case of asynclitism of the head, the cause of the condition must be determined. Its presence suggests the existence of a contracted pelvis, and, if such is found to be the case, the treatment proper to the degree of contraction must be adopted. Posterior asynclitism may be corrected, if the pelvis is normal, by applying an abdominal binder in such a manner as to bring the axis of the uterus into a proper relation to the axis of the pelvic brim.

Anterior asynclitism differs from posterior, however, in that while a certain degree of the latter is necessary for the passage of the head in a flat pelvis, the former is always of unfavourable import, and

must not be allowed to persist. In cases in which no contraction of the pelvis is found, an attempt may be made to correct the asynclitism by means of combined external and internal manipulation of the head. If this attempt fails, or if the condition recurs, podalic version must be performed.

In a normal case, the child will begin to cry as soon as it is born; if not, any slight cutaneous stimulation will cause it to do so. If there is mucus in the mouth or throat, it must be cleared out *before* attempting to make the child inspire. Then, a dash of cold water or a couple of smart slaps on the hand, are the time-honoured methods of promoting inspiration. Lastly, the cord has to be tied, and the child thus separated from the placenta.

Formerly, it was a subject of great dispute, whether the cord should be tied the moment the child had cried, or whether the application of the ligatures should be deferred until the cord had ceased to pulsate. White, of Manchester, was one of the first, or the first, to point out the advantages of late ligation, and the correctness of his teaching was finally established by Budin's experiments, which showed that the child receives an additional three ounces of blood by adopting this practice. This influx of blood is due to thoracic aspiration, and the blood thus sucked in goes to fill the additional vessels which are opened by the establishment of the pulmonary circulation. The result of experimental research is to prove that children in whose case late ligation of the cord has been performed, are more vigorous and regain their original weight more rapidly than those in whose case early ligation

has been performed. The cord, therefore, should not be tied until it has stopped pulsating. It is then tied with two ligatures, one applied two inches from the umbilicus of the child, and the other as close as possible to the vulva of the mother. Before applying the second ligature, draw gently on the cord, so as to pull out any loops that may be lying in the vagina; the reason for this will be explained subsequently. The cord is then divided half an inch above the first ligature, and the child taken away.

Third Stage.—The indication for treatment in the third stage is to promote the contractions of the uterus, in order to cause the expulsion of the placenta and of any clots which may be present, and to prevent hæmorrhage or the admission of air into the uterine cavity. With these objects in view, we turn the patient on her back the moment the child is born, and lay the hand on the fundus of the uterus. This hand must be so applied as to cover the entire fundus. It thus "controls" the uterus—noting the occurrence or cessation of the uterine contractions, and, during the latter, preventing the undue accumulation of blood in the cavity by exerting firm pressure. If the hand is laid only upon the anterior surface of the uterus, especially the lower part of it, we are apt to stimulate that portion to contract, thus causing irregular contractions, or the so-called hour-glass contraction. A good method of applying the hand is to sink it into the abdomen, with its ulnar border downwards, in the direction of the lumbar spine. Then the entire fundus lies in the concavity of the hand, and it is impossible for it to become distended with blood without our knowledge.

Having the uterus under control, the placenta must next be considered. Two questions may be asked with regard to its delivery. First, how can it be delivered? Secondly, when should it be delivered?

How can the placenta be delivered? It can be delivered:—

(1) By the natural efforts of the patient.
(2) By the Dublin method* of expression from above.
(3) By passing the hand into the uterus, and taking it away.
(4) By pulling upon the cord, and thus dragging it out.

(1) As the uterus contracts down after the birth of the child, the placental site becomes very greatly reduced in size, so that it is no longer large enough for the placenta. The latter, being too dense to be crumpled up so as to suit its reduced area of attachment, becomes detached, and lies loose in the uterus. Thence, after several contractions, it is expelled into the vagina. If the case is left entirely to nature, it lies there for some time, and is gradually worked downwards, helped by any contractions of the abdominal muscles that may occur. This is a tedious process, and lasts on an average two or three hours.

It is thus seen that there are two periods in the delivery of the placenta:—

The first period includes the detachment and expulsion of the placenta from the uterus.

* This method is also known as "Credé's method." It was, however, practised in the Rotunda Hospital, and described by M'Clintock and Hardy in their 'Practical Observations on Midwifery,' 1848, several years before Credé taught its use (1853). *Vide* also Barnes, 'Obstetric Operations,' 3rd edition, p. 522.

The second period includes the expulsion of the placenta from the vagina.

(2) Expression by the Dublin method during the first period of placental delivery will materially shorten the third stage. It is, however, very liable to cause post-partum hæmorrhage, as the uterine fibres will not have had time to retract properly, and so to obliterate the vessels; also small portions of placenta are frequently left behind. If, however, expression is delayed until the second or vaginal period of placental delivery, then the Dublin method of expression is a most important mode of treatment, and a perfectly safe one.

(3) There are the same objections to manual removal during the first period of placental delivery as to expression, with the added objection that the risk of sepsis is very much increased. When the second period has commenced, manual removal has no advantage over expression, but rather many obvious disadvantages.

(4) Traction on the cord is the worst of all methods of removing a placenta during the first period of its delivery. As the cord is usually inserted near the centre of the placenta, traction causes detachment of the latter, at first, in the centre. A cavity is thus formed behind the placenta, into which blood is sucked as the cord is pulled upon. This in itself is of no great consequence so long as the amount of blood lost is small. If, however, the further delivery of the placenta is delayed for any cause, such as uterine inertia or dense adhesions between its remaining undetached portion and the uterus, the amount of hæmorrhage may become very serious.

Again, if the adhesions between the uterus and placenta are so dense as to prevent separation, strong traction on the cord may cause inversion of the uterus in cases of fundal insertion of the placenta. If the second period of placental delivery has commenced, then traction on the cord may be employed to complete delivery. It has, however, no advantages over expression.

The safest and best treatment, then, is to leave the management of the first period of placental delivery to nature. As soon as the second period has commenced, it can be expedited most safely by adopting expression, as in the Dublin method.

The foregoing also answers the second question, *when should the placenta be delivered?* The placenta should be delivered as soon as it has left the uterus, *i. e.* as soon as the second period of its delivery has commenced. Premature delivery exposes the patient to the danger of post-partum hæmorrhage and subsequent sapræmic trouble, by favouring the retention of fragments. Leaving the entire process to nature means keeping the patient for a longer period than is necessary from the rest she requires.

How is it possible to tell when the placenta has left the uterus ? There are four indications :—

(1) *The cord lengthens.* When the cord is being tied two ligatures are used,—one near the umbilicus of the child, the other as close as possible to the vulva of the mother, having first pulled upon the cord slightly, in order to withdraw any portion of it which may be coiled up in the vagina. As the placenta leaves the uterus and comes into the vagina, it is obvious that the portion of cord outside

the vulva will be increased in length; and so the ligature, which originally was tied as close to the

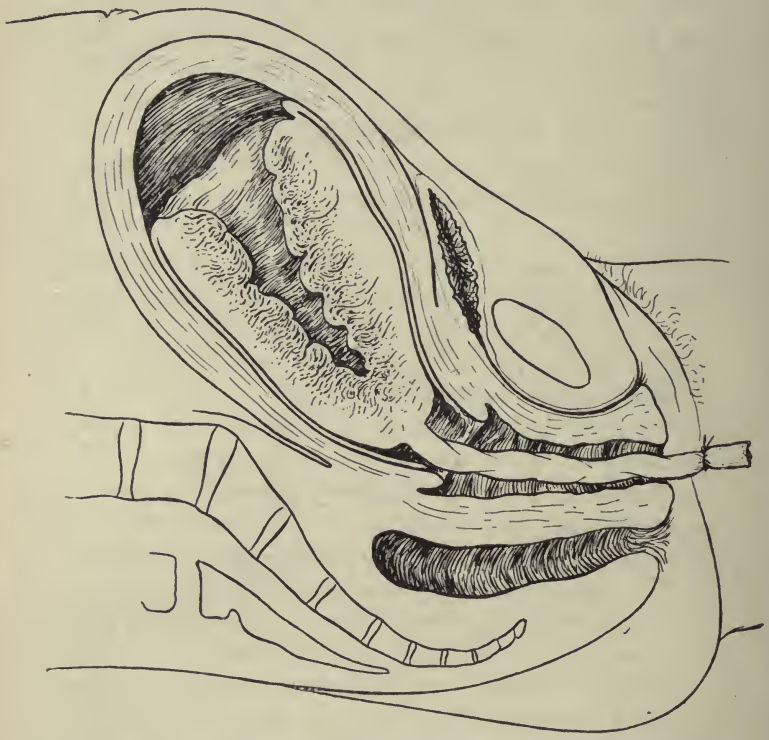


Fig. 80.—Diagrammatic representation of the condition of the uterus and placenta before the expulsion of the placenta from the uterus.

vulva as possible, will come to lie four to six inches away from it.

(2) *The fundus rises upwards almost to the level of the umbilicus.* When the child is born, the portion of the uterus above the contraction ring sinks into

the thinned-out lower uterine segment and vagina, under the pressure of the abdominal muscles and the controlling hand of the assistant (*v.* Fig. 80). As the placenta is expelled from above the contrac-

Fig. 81.—Diagrammatic representation of the condition of the uterus and placenta after the placenta has been expelled into the vagina.

tion ring, it comes to occupy the place where the upper part of the uterus had been; and, consequently, the latter is pushed upwards out of the pelvis, and the fundus is felt at or above the level of the umbilicus (*v.* Fig. 81).

(3) *The mobility of the uterus is increased.* When the uterus has partially sunk into the pelvic cavity with the placenta inside it, it is supported on all sides by the pelvic brim, and cannot readily be moved from side to side (*v.* Fig. 80). But, as it rises, it loses this support, and becomes balanced—if the term may be used—on the top of the placenta, and so can be moved about with ease from side to side. This is well shown in the diagram.

(4) *The abdominal wall bulges forward, above the pubes.* This is due to the presence of the placenta in the vagina, or in the lower uterine segment. The placenta, lying there, pushes forward the anterior vaginal wall, and in front of it the bladder and the abdominal wall, thus simulating the appearance caused by a full bladder (*v.* Fig. 81).

As soon as we know by these signs that the uterus is empty, the placenta may be expressed by the Dublin method. To do this, grasp the fundus with one or both hands during a pain, and press it downwards and backwards in the direction of the last piece of the sacrum (*v.* Fig. 82). By this means the uterus is pressed down into the vagina, and the placenta is driven out before it. The latter is immediately supported by the hands of the nurse, and gently drawn downwards in such a manner as to cause the uniform stripping of the membranes off the inside of the uterus. Another method of bringing away the membranes is to rotate the placenta round several times, and so by twisting the membranes into a cord to cause their detachment.

Let us repeat in a few words the management of the third stage. The moment the child is born the

patient is turned on her back, and the doctor or nurse "controls" the fundus with one hand. As soon as the cord has ceased pulsating, it is tied by the nurse, as described above, and the child separated. If the bladder is full, it ought to be emptied, as pressure applied over a distended bladder causes an

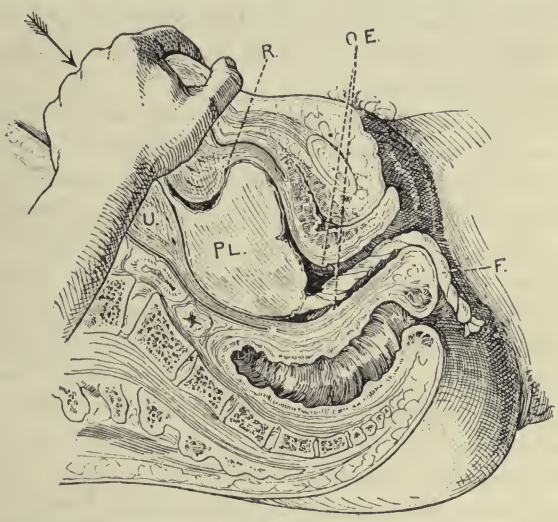


FIG. 82.—The Dublin method of expressing the placenta from the vagina. Pl. Placenta. U. Uterus. R. Retraction ring. O.E. Os externum. F. Funis.

unnecessary amount of pain. Nothing further is done until the placenta has left the uterus. As soon as this occurs, the placenta is expressed from the vagina, seized in the hands, and drawn gently downwards, so as to bring away the membranes entire. The third stage is thus completed, and nothing remains but to wash all blood off the patient and to apply to the vulva a sanitary towel or diaper, wrung out of

corrosive sublimate, and a tight abdominal binder. During all this time, the hand must be kept on the fundus, in order to prevent the uterine cavity from filling with clots. It should not be removed until the last pin of the binder is inserted. Finally, the nurse or doctor must examine the uterus every now and then for an hour or so after delivery by placing the hand over it, in order to be sure that it remains properly contracted.

The importance of applying sterilised dressings to the vulva, both immediately after delivery and during the puerperium, is not as generally appreciated as it ought to be. The vulva and vagina are at this time, to all intents and purposes, identical with an open surgical wound, and should be treated accordingly. If sterilised dressings cannot be obtained, an antiseptic dressing may be used instead. The simplest method of preparing this is to cut up pads of gamgee tissue at the beginning of labour, and to put them in a basin of corrosive sublimate lotion. They are then ready for use when required.

Ergot.—The knowledge of the action of ergot is of great importance. It is undoubtedly of service at certain times, but given at the wrong time it is most dangerous. The contractions caused by ergot are tonic and not intermittent, and so they differ from the physiological contractions of the uterus. This fact indicates the time at which ergot may be given. It may be given, when tonic contraction of the uterus is not dangerous to mother or child, and, with few exceptions, this is only when the uterus is empty. If ergot is given during the first stage of labour, it will delay the dilatation of the os, and

cause dangerous pressure upon the child. In the second stage, ergot is dangerous, unless it is certain that there is no obstacle to the rapid birth of the child. This excludes its use in most cases. In the third stage, it is also contra-indicated, as it may cause incarceration of the placenta. Then, if hæmorrhage occurs, the condition of affairs is very serious. Hæmorrhage, occurring during the third stage, usually requires the removal of the placenta; but, if ergot has been given, the region of the internal os may be so tightly contracted that this is impossible.

When, therefore, may ergot be given? It may be given when the uterus is empty, in order to promote tonic contraction, and in very few cases is it advisable to give it during any of the three stages of labour. It may be given as a routine treatment as soon as the placenta comes into the vagina, or even a little sooner, if we are prepared to take away the placenta before the ergot commences to act. Ergot, given by the mouth, causes uterine contractions in from ten to fifteen minutes. The Pharmacopœial dose—up to forty minims—is too small; the usual dose is one drachm, but from one to two drachms may be given with safety. Ergot, given hypodermically, acts in five minutes, or even less. Up to one twenty-fifth of a grain of the citrate of ergotinin may be given.

Anæsthesia.—We may assume that the objections to anæsthesia during labour on moral grounds have long been completely swept away. The objections on the ground of danger are not sufficiently supported by facts to need consideration. It may, then, be assumed that the use of an anæsthetic

during labour will be of frequent occurrence. The degree of anæsthesia necessary is not always the same. Two classes of cases are met with—those in which anæsthesia is induced solely to relieve pain, and those in which, in addition to relieving pain, it is necessary to have the abdominal muscles, etc., thoroughly relaxed in order to perform some operation; that is to say, there are two degrees of anæsthesia employed during labour :—

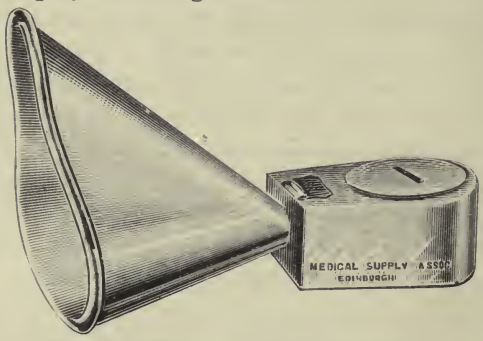


Fig. 83.—Murphy's chloroform inhaler.

(1) Partial or so-called "obstetrical" anæsthesia.

(2) Complete or surgical anæsthesia.

(1) *Obstetrical anæsthesia* may be adopted in all labour cases with the object of relieving pain. It does not tend to asphyxiate the child unless unduly prolonged—more than four hours (Dührssen),—to check labour pains, nor to favour the occurrence of post-partum hæmorrhage. On the contrary, many patients who will not "bear down," owing to a dread of increasing the pain, will do so when "obstetrically" anæsthetised. The best anæsthetic for the

purpose is undoubtedly chloroform, and one of the best means of administering it is by "Murphy's inhaler" (*v.* Fig. 83). This inhaler is made of metal, and consists of a chamber containing a sponge, on which the chloroform is poured, and a face-piece, either oral, or, better, oro-nasal. There are two valves, usually made of rubber, which allow only *inspirations* to pass through the chloroform chamber. To use the inhaler, a teaspoonful of chloroform is placed on a sponge, and the cap applied. The patient is then given the inhaler to hold, and shown how to put it to her mouth and breathe through it. She does this when a pain is commencing, with the result that she becomes semi-unconscious, and allows the inhaler to fall. Then, as consciousness returns, she again breathes through it, and so on. In this way a sufficient degree of anæsthesia is maintained, and at the same time the doctor and nurse can, if necessary, attend to other things. Anæsthesia should not be started until the patient has passed into the second stage of labour.

(2) *Surgical anæsthesia* is necessary in order to facilitate the performance of many obstetrical operations. Chloroform is again the most suitable anæsthetic, as it is most easily administered. If, however, there are many grave contra-indications to its use, ether must be substituted. The easiest mode of administering chloroform is on a Skinner's mask, or on a handkerchief. Chloroform must never be administered in the immediate neighbourhood of a candle or lamp, as such light decomposes it into chlorine gas and hydrochloric acid. Inhalation of these may set up a most serious pneumonia (Zweifel).

CHAPTER X.

CEPHALIC PRESENTATIONS (*continued*).

Face Presentation: Frequency—Ætiology—Positions—Diagnosis—Mechanism—Abnormal Mechanism—Moulding of Head—Treatment—Prognosis. Brow Presentation: Frequency—Ætiology—Positions—Diagnosis—Mechanism—Moulding of Head—Prognosis—Treatment. Anterior Fontanelle Presentation. Posterior Fontanelle Presentation.

FACE PRESENTATION.

Face presentation occurs when the head becomes fully extended (*v.* Fig. 85). It is, so to speak, a *secondary* or *resultant* presentation, and, save in rare cases of fœtal malformation, only occurs after the commencement of labour.

Frequency.—For the reasons explained under the mechanism of vertex presentations, this presentation is rare (*v.* page 159). Its average proportion is usually stated to be 1 in 250. At the Rotunda Hospital amongst 24,818 cases of immature, premature, and full term labour, the relative frequency of face presentation was 1 in 408·49, *i. e.* 0·24 per cent.

Ætiology.—Face presentation may arise in three ways. It may be due to :—

(1) Anything that prevents flexion ; as,—tumours

about the neck of the child, enlarged thyroid, and hydrothorax.

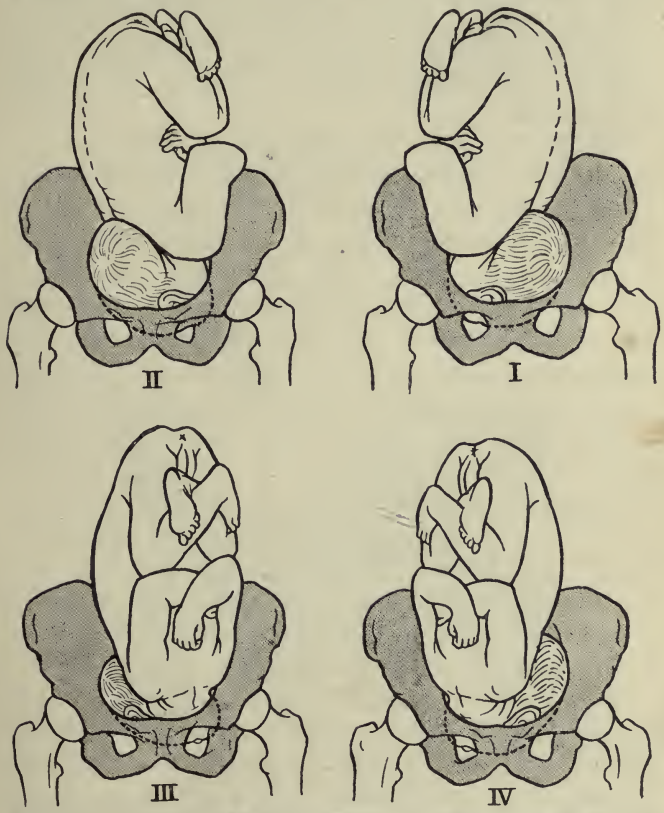


Fig. 84.—The four positions in which the fœtus may lie in face presentation.

(2) Anything that tends to arrest the occiput at the brim, whilst at the same time permitting descent of the forehead; as,—obliquity of the uterus, contracted pelvis, or small tumours about the brim.

In lateral obliquity of the uterus the head of the child, instead of being driven directly downwards into the brim, is driven against the opposite side of the brim, the result being, that the descent of the occiput is arrested, and the descent of the chin is favoured.

(3) Malformation of the child's head; as,—a congenital dolichocephalic head—*i. e.* a head, the occiput of which is unduly prominent. It is easy to understand that, if such a thing as a congenital dolichocephalic head exists, it would favour face presentation (*v.* page 159). We must, however, bear in mind that the moulding which the head undergoes in a face presentation causes dolichocephalism, and that, therefore, what we imagine to have been the cause of a face presentation, may in reality only be the result of it.

Positions.—Four positions are recognised :—

1st position, back to the left and in front.
2nd position, back to the right and in front.
3rd position, back to the right and behind.
4th position, back to the left and behind.

The first position is the most common.

Diagnosis.—**Abdominal Palpation.**—The pelvic pole of the fœtus is found at the fundus of the uterus, and is recognised by the characteristics which have already been mentioned. The body of the fœtus lies vertically, with the back towards one or other side, according to the position. If the back is posterior, the limbs are felt with greater distinctness than in the case of a vertex presentation, owing to the extension of the head, which forces the abdominal wall and limbs of the fœtus into close contact

with the anterior uterine wall. For a similar reason, the back, if anterior, lies at a deeper level in the uterus, and the limbs are felt with greater difficulty, than in a first or second vertex presentation. The head is found in the lower pole of the uterus, if it

Fig. 85.—Face presentation. The fœtus as felt by abdominal palpation. (*Farabeuf.*)

has not passed below the brim. The occiput forms a rounded and prominent tumour, which completely fills the pelvic brim on the side corresponding to the back of the fœtus. The chin is felt as a small tumour "like an animal's hoof" (Budin), resting on the brim on the same side as the limbs. The occiput

lies at a higher level than the chin, and the groove of the neck runs obliquely in a corresponding direction. If the head has passed below the brim, the fingers can be sunk deeply into the pelvis on the side of the limbs, while on the side of the back they are stopped by the prominence formed by the occiput.

The position of the fœtus is ascertained by noting whether the back is turned to the left or the right, and anteriorly or posteriorly.

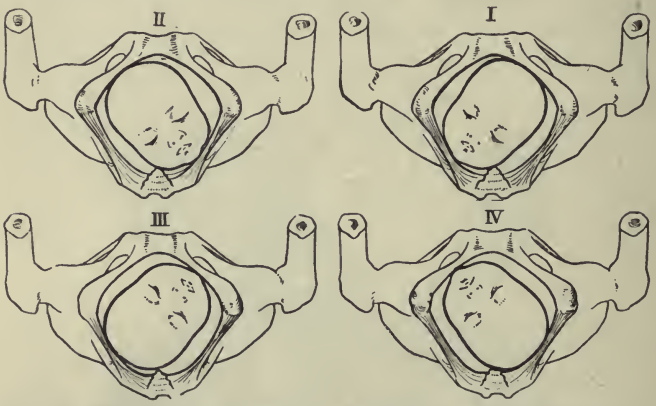


Fig. 86.—The four positions of the fœtal head in face presentation, as felt from below.

Vaginal Examination.—At the onset of labour, the presenting part can be reached only with difficulty *per vaginam,* as the face is delayed for some time above the brim. If the membranes are not ruptured, we can feel their conical protrusion into the vagina (*v.* page 65). Later on, as the head descends, the presenting part can be felt; but there is considerable difficulty in ascertaining what it is. As a result of the long labour, a large caput suc-

cedaneum forms upon the face, and causes it to resemble a breech. The diagnostic points are the supra-orbital ridges, the malar bones, and the mouth which has to be distinguished from the anus (*v.* pp. 63, 239) (Fig. 87). If the nature of the presenting part cannot be thus determined, endeavour to pass a finger upwards, between the presenting part and the pelvis. In the case of a breech we come upon the angle of the groin, in the case of a face upon the ear. In examining a face presentation by vaginal examination, particular care must be taken not to injure the eyes. It is said that the introduction of the finger into the mouth may cause attempts at inspiration on the part of the child, and so lead to blocking of the air-passages by liquor amnii or mucus.

The position of the fœtus is ascertained by noting the relations of the different bony landmarks of the face to one another and to the pelvis (*v.* Fig. 86).

Auscultation.—The fœtal heart is heard at a higher level than in a vertex presentation, and, in cases in which the chin is directed anteriorly, is best heard over the limbs instead of over the back, as is usual in vertex or breech presentations. This is due to the fact that the chest and limbs of the child are pressed against the abdominal wall of the mother, while the back is far away from it.

Mechanism.—The diameters of the head that come into play in a face presentation are :—the cervico-bregmatic, $3\frac{3}{4}$ inches; and the bi-parietal, $3\frac{3}{4}$ inches. The actual measurement of the cervico-bregmatic diameter is almost the same as that of the sub-occipito-bregmatic, but it cannot be reduced to

the same extent by moulding. The mechanism of face presentation resembles, very closely, that of vertex presentation, if extension is substituted for flexion, flexion for extension, and the chin for the occiput. The various steps are as follows :—

(1) and (2).—**Descent and Extension.**—The face engages with its cervico-bregmatic diameter in the transverse diameter of the pelvis, or, according to some writers, in one of the oblique diameters.

Fig. 87.—Face presentation. The fœtal head as felt from below. The arrow shows the direction in which internal rotation takes place. (*Farabeuf.*)

As the head descends, it at the same time, extends until the occiput is almost in contact with the back of the child (*v.* Fig. 85).

(3) **Internal Rotation.**—Descent continues until the face reaches the pelvic floor, and then, obedient to the rule of internal rotation (*v.* page 163), the chin, which is lowest, rotates in front (*v.* Fig. 88). It is characteristic of face presentations, that internal rotation occurs at a much later stage, and takes a longer time to be completed, than in vertex presentations; so much so, that the swollen face

may have appeared at the vulva before rotation commences.

(4) **Flexion.**—The chin now lies under the symphysis, and the head rotating round the latter is born by flexion; first the mouth and nose, then the eyes, forehead, and occiput appearing from behind the perinæum (*v.* Fig. 88).

(5) **External Rotation.**—External rotation occurs

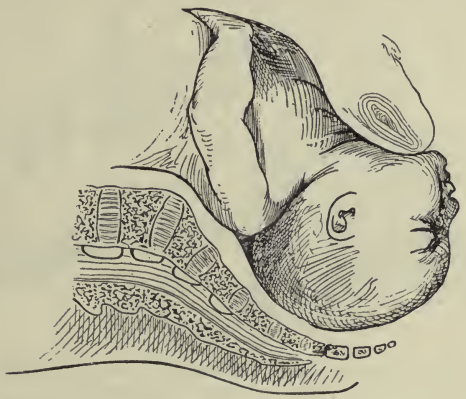


Fig. 88.—Face presentation. Internal rotation complete, flexion commencing.

as in a vertex presentation, and consists of restitution and external rotation proper. The chin turns back to the side at which it originally lay.

Abnormal mechanism.—In some cases, probably owing to incomplete extension of the head, the chin of the child rotates posteriorly into the hollow of the sacrum. This is a practically hopeless condition for the child, unless either the head is very small or the pelvis very large.

Moulding.—In face presentation, the cervico-

bregmatic, sub-occipito-bregmatic, supra-occipito-mental, and bi-parietal diameters are diminished, while the occipito-frontal and occipito-mental diameters are increased (*v.* Fig. 90). The caput succedaneum forms over the face, and may cause extreme distortion owing to the increased duration of labour, and the nature of the tissues involved. The swelling, however, passes off in a few days.

Fig. 89.—Face presentation. Flexion is complete, the head is born, and restitution has occurred.

Treatment.—A face presentation can be treated in three ways:—

(1) If recognised in time it may be changed to a vertex.

(2) Podalic version may be performed.

(3) It may be allowed to remain a face and treated accordingly.

(1) If a face presentation is diagnosed in time, and it is decided to change it to a vertex, the method of Schatz is the most suitable. It requires, for its performance, three conditions to be present:—

(*a*) Unruptured membranes.
(*b*) The face not yet fixed in the brim.
(*c*) A lax abdominal wall.

To obtain the last an anæsthetic is usually necessary, though it need not be given if the patient will refrain from straining. The details of the operation are as follows:—Anæsthetise the

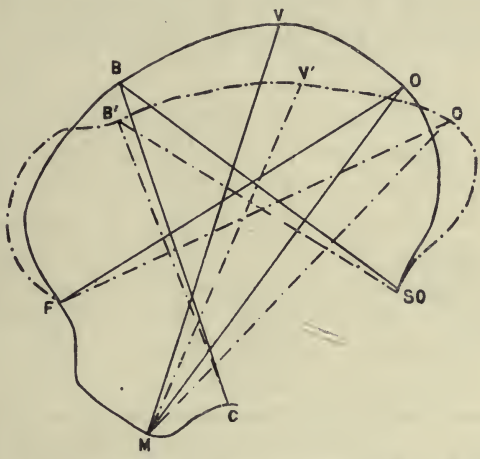


Fig. 90.—Face presentation. The moulding of the fœtal head. The dotted outline shows the shape of the moulded head, the firm outline of the unmoulded head. (*Budin.*)

patient and palpate the abdomen carefully in order to ascertain the position of the child. Then, sitting by the side of the patient and facing her feet, place both hands upon the shoulder and back of the child, and draw them directly upwards out of the pelvis. Next, with one hand on the chest, push the latter in the direction of the child's back, while the other hand on the breech pushes it in the opposite

direction. Lastly, push the breech directly downwards towards the pelvis, apply a tight binder, and, if the vertex does not fix, rupture the membranes (*v.* Fig. 91). The danger of this method is, that complete flexion of the head may not be obtained, and so a brow presentation result.

If Schatz' method does not succeed, an attempt may be made to correct the presentation by combined internal and external manipulation. If the

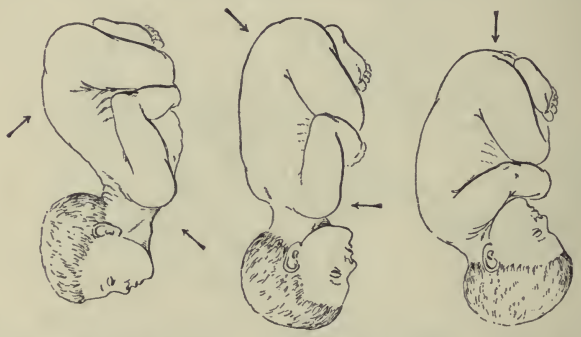


Fig. 91.—Schatz's method of converting a face into a vertex. The arrows show the directions in which the body of the child is pushed. (*Lusk.*)

cervix is only partially dilated, the method of Baudelocque may be tried. Place the patient in the cross-bed position, and introduce into the vagina the hand which corresponds to the side towards which the face is turned, and pass two fingers into the uterus. Then, by pressure, first upon the lower jaw, next upon the upper jaw, and finally upon the forehead push the face upwards, while at the same time the other hand pushes down the occiput from without. If the os is sufficiently

dilated, the entire hand may be passed into the uterus and the whole face grasped and pushed upwards. If this does not succeed, the process is repeated, and at the same time an assistant pushes the shoulders of the child in the direction of its back and the breech in the opposite direction, as in Schatz' method (Ziegenspeck).

An alternative method, which may be tried if the os is sufficiently dilated, is that recommended by Partridge. It consists in introducing into the uterus the hand which corresponds to the side towards which the vertex is turned, and passing it upwards until the fingers lie over the occiput. The occiput is then grasped, and drawn downwards, while at the same time the outside hand pushes the chest of the child upwards and in the direction of the back.

(2) If none of the foregoing methods succeed, or if, after their performance, the face presentation returns, and if we have any reason to think that the fœtus will not be delivered spontaneously as a face presentation, it is best to turn the child into a pelvic presentation and bring down a foot.

(3) If a face presentation is allowed to persist, or if it is too late to alter it, it is well to warn the patient's friends that it will probably be a tedious labour, and that there is considerable danger for the child, as well as marked temporary disfigurement. The treatment of all abnormal presentations in the first stage prevails. Keep the patient in bed, and avoid anything likely to cause rupture of the membranes. Let her lie upon the side at which the chin is, as this favours its anterior rotation. As the face approaches the perinæum, it is well to examine, to

determine if this anterior rotation is occurring. If we think it is not, it can be assisted to do so. Bear in mind the law which governs internal rotation (*v.* page 163), and press the forehead upwards during a pain. This causes the chin to become the lowest part of the face, and so favours its anterior rotation. If this still does not occur, an attempt may be made to rotate the face manually, by grasping it with the fingers of one hand introduced into the vagina. The head is made to rotate in whichever direction will bring the chin anterior by the shortest route, and, at the same time, the external hand pushes the anterior shoulder in the same direction as the face is being turned. If the chin rotates posteriorly, perforation will be necessary. This is all that can be done to help the case. The forceps is dangerous for the child, unless internal rotation has occurred. After this has occurred, the forceps is very rarely necessary, except in those cases in which the non-expulsion of the child is due to uterine inertia (*v.* page 390).

We may sum up the treatment of face presentation in a few words. If the fœtus and the pelvis are of normal size, allow the presentation to persist. Avoid anything likely to cause premature rupture of the membranes, and do not apply the forceps save as a last resource. If there is any reason to think that the fœtal head is large in proportion to the size of the pelvis, try to change the presentation into a vertex, and if this cannot be done perform podalic version. If the child dies during labour and the presenting part is not advancing, and an indication for delivery arises, perform craniotomy.

Prognosis.—The mortality in face presentation is somewhat higher for the mother and considerably higher for the fœtus, than in vertex presentation. The fœtal mortality is usually estimated at thirteen per cent.

BROW PRESENTATION.

The fœtus is said to present by the brow when that part of the head between the supra-orbital

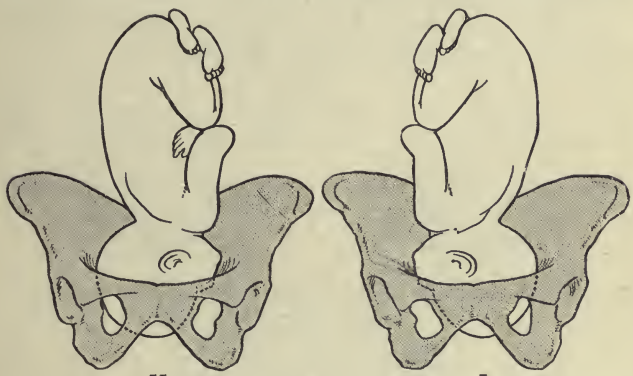


FIG. 92.—The two positions in which the fœtus may lie in brow presentation.

ridges and the anterior fontanelle lies lowest (*v.* Fig. 93). A brow presentation, like a face presentation, is a secondary or resultant presentation, occurring after labour has commenced.

Frequency.—The proportion of cases in which a brow presentation occurs is difficult to ascertain, as in many cases of brow presentations, flexion recurs and a vertex again results, or extension continues and a face presents. The proportion of cases in

which a brow is either recognised and changed, or remains unchanged, is said to be about 1 in 500. At the Rotunda Hospital in 24,818 cases of immature, premature, and full term labours, the relative frequency of brow presentation was 1 in 638·92, *i. e.* 0·15 per cent.

Ætiology.—The causes of a brow presentation are very similar to those of a face presentation (*v.* page 210).

Positions.—As the head almost always engages transversely in these cases, it is unnecessary to recognise more than two positions, as follows :—

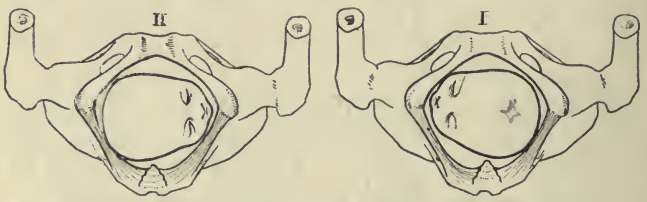


Fig. 93.—The two positions of fœtal head in brow presentation as felt from below.

1st position—back to the left.

2nd position—back to the right.

In all probability the first position is the more common.

Diagnosis.—**Abdominal Palpation.**—Nothing characteristic is noticed in the attitude of the body of the child. On making the pelvic grip, the head will be found to lie well above the brim at the commencement of labour, with the chin and occiput on the same level (*v.* Fig. 92). The position of the fœtus is ascertained by noting the relation of its back to the middle line of the mother.

Vaginal Examination.—The presenting part can only be reached with great difficulty at the commencement of labour, owing to the high situation of the head. The membranes are felt bulging in a cone-shaped tumour, as is usual in abnormal presentation. Later in labour, if the head descends, the presentation is characteristic. On one side of the

Fig. 94.—Brow presentation. Head engaging in the brim.

pelvis, is felt the anterior fontanelle and the smooth frontal bone with its median suture; on the other side, the supra-orbital ridges, the hollows of the eyes, and the prominent malar bones.

The position of the fœtus is ascertained by noting the side of the pelvis to which the smooth forehead and the irregular face are respectively turned.

Auscultation.—The heart is heard slightly to one

or other side of the median line, according to the position of the back of the child.

Mechanism.—The diameters of the head, which engage in the brim in a brow presentation, are the supra-occipito-mental (5½ inches), and the bi-parietal (3¾ inches). In many cases the head does not enter the brim at all. If it enters the brim, the supra-occipito-mental diameter of the head lies in the

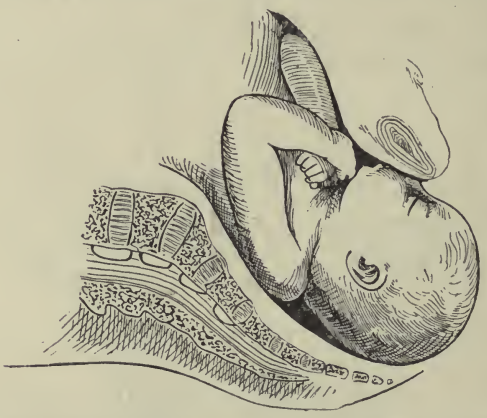


Fig. 95.—Brow presentation. Internal rotation complete.

transverse diameter of the pelvis. Four possibilities are then present:—

(1) With a small head or a large pelvis a brow presentation may be born unchanged.

(2) A brow presentation may be converted into a vertex presentation.

(3) A brow presentation may be converted into a face presentation.

(4) The head may become impacted in the pelvis.

If a brow presentation is to be born unchanged, internal rotation must take place in such a direction that the face rotates forward (*v.* Fig. 95). The jaw then fixes behind the symphysis, and the head rotating round the latter, the cranial vault sweeps over the perinæum, and lastly the face descends from behind the symphysis.

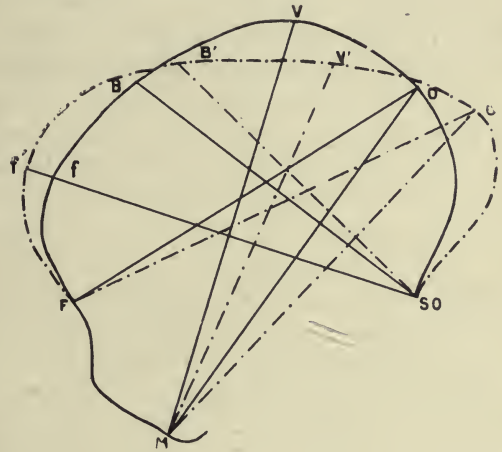


Fig. 96.—Brow presentation. The moulding of the fœtal head. The dotted outline shows the shape of the moulded head, the firm outline of the unmoulded head. (*Budin.*)

Moulding.—In brow presentation the sub-occipito-bregmatic, the supra-occipito-mental and the bi-parietal diameters are diminished; while the occipito-frontal, the occipito-mental, and the sub-occipito-frontal diameters are increased (*v.* Fig. 96). The caput succedaneum is formed over the most prominent part of the forehead, and is usually of large size.

Treatment.—The first thing to understand clearly is, that a brow presentation is never to be left uncorrected, if it can be changed, unless we are sure that the head of the fœtus is small relatively to the size of the pelvis. If it cannot be changed into either a vertex or a face presentation, and if it is too late to perform podalic version, its expulsion is best left to the natural efforts alone. Nature will frequently correct a case which we cannot. The forceps should never be used except as the last chance before perforation, and not even then if the face is posterior. A brow presentation can be corrected in three ways:—

(1) By completing flexion, *i. e.* by turning it into a vertex presentation.

(2) By completing extension, *i. e.* by turning it into a face presentation.

(3) By version and bringing down a foot.

(1) If the brow is free above the brim, or at any rate not too deeply engaged, it may be converted into a vertex by Schatz' method (*v.* page 218), or, if this fails, by the following method :—The operator, with one hand in the vagina, pushes the head upwards out of the pelvis, directing his force especially against the forehead so as to favour flexion. An assistant then presses the child's shoulders in the direction of its back, as in Schatz' method (*v.* page 218). Flexion is finally completed, either by pushing the occiput downwards into the pelvis by pressure through the abdominal wall, or by pulling it down with the vaginal hand, which has been passed above it. The head is then kept in this position by means of a tight binder, and the membranes ruptured, if this has not been already done.

(2) If the brow is too far down in the pelvis to be converted into a vertex, we may endeavour to change it into a face. This is best done by pressing upwards at each side of the large fontanelle during a pain, as this will tend to cause the descent of the chin. It will probably be unsuccessful, except in those cases in which nature would have brought about the same result.

(3) Podalic version must, if possible, be adopted when, after a vertex presentation has been obtained, the head returns to its original position.

If a brow presentation cannot be corrected, similar precautions are taken as have been described under the treatment of face presentation. The patient lies on the side towards which the face is turned in order to favour the rotation of the latter forwards.

If at any time the child is found to be dead, perforation should be performed, unless the head is about to be delivered by the natural efforts.

Prognosis.—The maternal and fœtal mortalities are considerably higher in this presentation than in vertex or face presentation, owing to the increased duration of labour.

ANTERIOR FONTANELLE PRESENTATION.

Definition.—An anterior fontanelle presentation is the term applied to the presentation when the head lies in a position midway between a vertex presentation and a brow presentation, the anterior fontanelle lying lowest (*v.* Fig. 97).

Ætiology.—Anterior fontanelle presentation, when found at the brim, is the result of a flat pelvis.

When found in the pelvic cavity, it is usually associated with a persistent occipito-posterior position of the head. In the former case the descent of the anterior fontanelle is due to the fact that the posterior transverse diameters of the head are greater than the anterior, and that consequently the descent

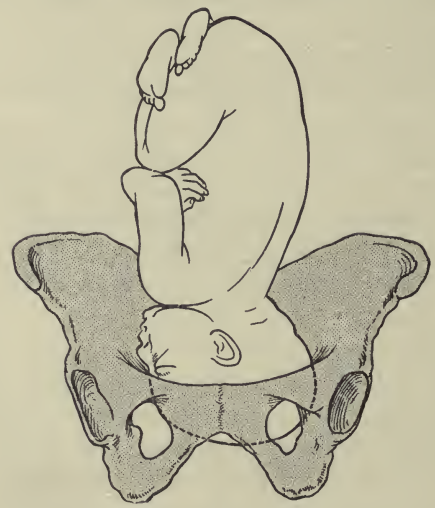


Fig. 97.—Anterior fontanelle presentation. Head engaging in the brim.

of the vertex is retarded, while the sinciput descends more readily.

Diagnosis.—Anterior fontanelle presentation cannot be recognised by abdominal palpation. It is diagnosed by vaginal examination, by noting the position of the anterior fontanelle.

Mechanism.—In a flat pelvis, the head engages with its antero-posterior diameters in the transverse

diameter of the brim, and then, in consequence of the obstruction offered to the descent of the bi-parietal diameter by the narrowed conjugate, it glides slightly towards the side of the pelvis at which the occiput lies. In this manner, a narrower diameter than the bi-parietal is brought into the conjugate diameter, and at the same time a slight degree of extension is produced, so bringing the anterior fontanelle lowest. The contractions of the uterus continuing, the head is then driven down through the brim. According to the degree of contraction present, there is, at the same time, a corresponding degree of posterior asynclitism (*v.* page 169).

Treatment.—As this presentation is the rule in flat pelvis, it must be encouraged to persist until the fore-part of the head has passed the brim. Accordingly, the patient is placed at the commencement of labour on the side at which the anterior fontanelle is. Subsequently—when the sinciput has passed the brim—she is placed on the opposite side in order to facilitate the descent of the posterior fontanelle.

In cases in which presentation of the anterior fontanelle is found after the head has descended into the pelvic cavity, the treatment as already described for persistent occipito-posterior position is adopted (*v.* page 168).

POSTERIOR FONTANELLE PRESENTATION.

Definition.—A posterior fontanelle presentation is the term applied to the presentation when the head lies in a fully flexed position, the posterior fontanelle lying lowest (*v.* Fig. 98).

Ætiology.—Posterior fontanelle presentation, when found at the brim, is the result of a generally contracted pelvis, of a generally contracted and flat pelvis, and of a very large fœtal head in a normal pelvis. When it is found in the pelvic cavity, it is part of the ordinary mechanism of a vertex pres-

Fig. 98.—Posterior fontanelle presentation. Head engaging in the brim.

entation. When it occurs at the brim, it is due to the increased obstruction to the descent of the head causing an increased degree of flexion.

Diagnosis.—The diagnosis is made by vaginal examination, by determining the low position of the posterior fontanelle.

Mechanism.—There is nothing special to note in the mechanism of a posterior fontanelle presentation.

If the disproportion between the head and the pelvis is great, delivery will be impossible.

Moulding.—The occipito-mental diameter is greatly lengthened, while the sub-occipito-bregmatic is more reduced than is normally the case. The result of this is that the head looks as if it had been drawn out.

Treatment.—When the posterior fontanelle presents at the brim, an attempt must be made to discover the cause. If the cause is pelvic contraction, the degree of contraction must be determined, and the treatment proper for such degree adopted (*v.* page 428). If the pelvis is normal the head must be allowed to mould for as long as possible. As soon as an indication for delivery occurs, the forceps must be tried. If it fails to deliver the fœtus, perforation will be necessary.

CHAPTER XI.

PELVIC PRESENTATION.

Pelvic Presentation: Frequency—Ætiology—Positions—Diagnosis—Mechanism—Abnormal Mechanism—Moulding—Treatment—Method of bringing down an Extended Arm—Methods of delivering the After-coming Head; a Modification of the Prague Method, Martin's Method, Smellie's Method—Prognosis.

The term pelvic presentation includes all cases in which the lower pole of the fœtus presents. Pelvic presentations are subdivided into:—

(1) Complete pelvic presentation, in which the breech and feet descend together (*v.* Fig. 100).

(2) Incomplete pelvic presentation, in which:—

(*a*) The breech descends alone, the legs being directed upwards along the body of the fœtus.

(*b*) One or both knees descend first.

(*c*) One or both feet descend first.

In considering the mechanism no difference need be made between complete and incomplete presentations.

Frequency.—The proportion of cases in which pelvic presentation occurs, varies from 1 in 80 in primiparæ, to 1 in 23 in multiparæ; knee presen-

tation occurs about once in 800 births. At the Rotunda Hospital the relative frequency of pelvic presentation amongst 24,818 cases of immature, pre-

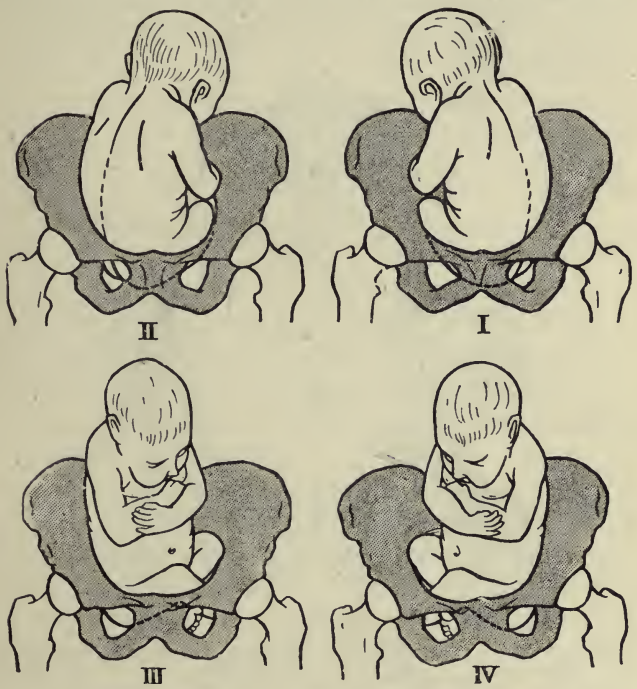


FIG. 99.—The four positions in which the fœtus may lie in pelvic presentation.

mature, and full term labours was 1 in 30·42, *i. e.* 3·2 per cent.

Ætiology.—The causes of cephalic presentation have been already mentioned, namely :—the uterus is of an ovoid shape, and the fœtus in its usual attitude is also of an ovoid shape; the fundus is the larger pole

of the uterus, and the podalic pole is the larger pole of the child. Accordingly, under normal circumstances, the breech is to be found at the fundus, and the head at the pelvic brim. Anything, therefore, which tends to change the shape of the uterus, or

Fig. 100.—Pelvic presentation. The fœtus as felt by abdominal palpation. (*Farabeuf.*)

of the child, may be considered to be a cause of malpresentation, and especially of breech presentation.

The principal of these causes are :—

(1) *Multiparous uterus.* The uterine walls have become lax.

(2) *Contracted pelvis.* The head is unable to adapt itself to the lower uterine segment.

(3) *Twins.* The uterus is over-distended.

(4) *Hydramnios.* The uterus is also over-distended.

(5) *Placenta prævia.* The placenta fills up the lower uterine segment, and so changes the shape of the uterine cavity.

(6) *Hydrocephalic head.* The cephalic pole of the fœtus is larger than the podalic pole.

(7) *Premature children.* The fœtus does not fill the uterine cavity, and, consequently, is not guided into its normal position.

(8) *Tumours, and faulty development, of the uterus.*

Positions.—Four positions are recognised:—

1st position, back to the left and in front,
2nd position, back to the right and in front.
3rd position, back to the right and behind.
4th position, back to the left and behind.

The first position with the back in front is slightly more common than the other positions.

Diagnosis.—**Abdominal Palpation.**—By this we determine that the fœtus is presenting by one or other pole, and that the opposite pole is at the fundus. The pole at the fundus is rounded, smooth, and ballottes easily from side to side independently of the back; there is, moreover, a groove between it and the back. This distinguishes it at once as the head. To confirm this diagnosis we palpate the presenting pole. It is tolerably round and hard, but it does not ballotte, nor move independently of the back, and, in a favourable case, the thighs can be felt springing from it, and the feet lying beside it.

The position of the fœtus is ascertained by noting whether the back is turned to the left or the right, and anteriorly or posteriorly.

Vaginal Examination.—The diagnosis can also be made by vaginal examination, but it is rather more difficult to do so. At the commencement of labour, owing to the tardy fixation of the breech, the presenting part can with difficulty be reached with the finger. At this stage the point most likely to attract attention is the peculiar way in which the membranes bulge.

When labour is more advanced, the presenting

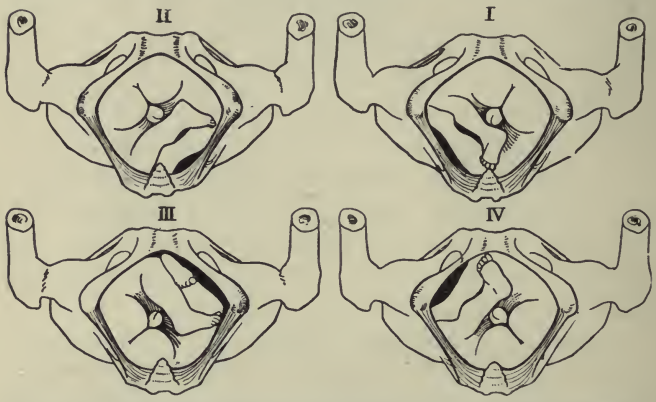


Fig. 101.—The four positions of the fœtal breech in pelvic presentation, as felt from below.

part descends within reach of the finger, and can be recognised (*v.* Fig. 102). It is not at all as easy to distinguish the breech by vaginal examination as is supposed. We can determine the presence of a large, firm, and rounded tumour, not at all unlike a vertex or a face on which a large caput succedaneum has formed. The breech may be distinguished by three bony points and by the anus. The bony points are the two tubera ischii and the tip of the coccyx, and they are so arranged as to form the

apices of an equilateral triangle. The anus can only be mistaken for the mouth. It is distinguished from the latter by the absence of the alveolar ridges and of the tongue, by the peculiar manner in which the sphincter grips the finger if the child is alive, and by the presence of meconium on the finger when withdrawn. If a limb has prolapsed, it will be necessary to distinguish between an elbow and a knee, or a hand and a foot. A knee is easily distinguished from an elbow by its larger size, and by the presence of the tuberosity of the tibia and the patellar ligament. The mobility of the patella is a fallacious sign, as the knee is always flexed when it presents, and so the patella is fixed. The foot can be most easily distinguished from the hand by feeling the heel. In default of it, the phalanges are the best guides; in the foot, the line of the tops of the toes is straight; in the hand, the line of the tops of the fingers is curved. Again, the thumb can be apposed and opposed to the palm; the great toe cannot.

The position of the fœtus is ascertained by noting the relation of the different characteristic parts of the breech to one another and to the pelvis (*v.* Fig. 101).

Auscultation.—The heart is heard slightly above the level of the umbilicus, and to one or other side of the middle line.

Mechanism.—The dimensions of the breech are not of any very great importance. They are considerably smaller than the dimensions of the head, and can be reduced still further by compression. The bi-trochanteric diameter is the longest, and

measures three and a half inches. The sacro-pubic diameter measures two inches. The mechanism of a breech presentation is very simple. It engages with the bi-trochanteric diameter in one of the oblique diameters of the brim. As it descends, the anterior buttock usually lies at a slightly lower level than the posterior. The former thus reaches the pelvic floor first, and, as a result, rotates in front and lies under the symphysis (*v.* Fig. 103). The posterior hip rotates round it, sweeps over the perinæum, and is

Fig. 102.—Pelvic presentation. The fœtal breech and lower limbs as felt from below. The arrow shows the direction in which internal rotation takes place. (*Farabeuf.*)

born. If the perinæum is intact, the anterior buttock is born first, but, if the perinæum is deficient, the posterior may be born first. The rest of the trunk then follows in a similar manner. The attitude of the child is the same as in a vertex presentation; consequently, the feet generally come out close to the breech, and the arms are folded across the chest. The head enters the brim with the chin flexed upon the chest, and the sub-occipito-bregmatic diameter lying in the opposite oblique diameter of the pelvis to that in which the bi-trochanteric diameter

lay. The occiput, as it descends, rotates in front, the chin being still closely applied to the chest, owing to the pressure of the coccyx and perinæum. The occiput now rests behind the pubes, while the face rolls out over the perinæum, the chin appearing first, then the mouth, nose, eyes, forehead, and occiput.

Abnormal mechanism.—In a small percentage of

Fig. 103.—Pelvic presentation. Internal rotation is complete, and the breech is advancing over the perinæum.

cases, the face of the after-coming head may rotate anteriorly instead of posteriorly. It is then rather more difficult to deliver.

Moulding.—In the after-coming head, the fronto-occipital and mento-occipital diameters are diminished, while the cervico-bregmatic and the sub-occipito-bregmatic diameters are slightly increased (*v.* Fig. 104). The representative of the caput succedaneum forms on the anterior buttock and the genitals. The scrotum is frequently greatly swollen,

and may be dark purple or black from capillary ecchymoses.

Treatment.—A pelvic presentation can be treated in one of two ways :—

(1) It can be turned into a vertex presentation by external version.

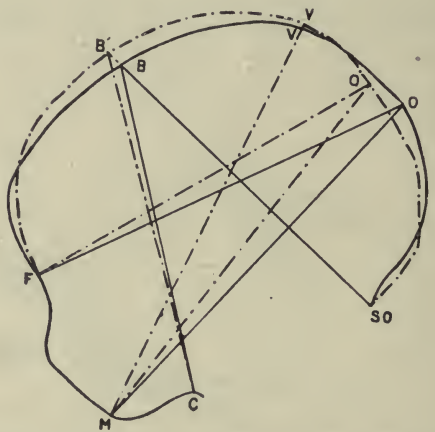


FIG. 104.—Pelvic presentation. The moulding of the fœtal head. The dotted outline shows the shape of the moulded after-coming head, the firm outline the shape of the unmoulded head. (*Budin.*)

(2) It can be left alone, and delivered as a pelvic presentation.

(1) A pelvic presentation is considerably more dangerous for the child than a vertex presentation, and also tends to cause extensive perinæal laceration owing to the rapidity with which it is necessary to deliver the after-coming head. Consequently, it would appear, at first sight, to be better to turn the child. Before deciding on this, the case

must be looked at from another point of view. Pelvic presentation is generally associated with some abnormal condition of either the child or the pelvis; and, in many of these conditions, a pelvic presentation is more favourable for mother or child, or perhaps for both, than a vertex. Therefore we must consider if version is likely to improve the condition of affairs. These conditions are:—slight degrees of contracted pelvis, hydrocephalic head, or placenta prævia. In the first two, an after-coming head is delivered more easily than is a head coming first; while, in the case of placenta prævia, where the proper treatment would be to draw down a leg, we have the leg close at hand. Before turning a breech into a vertex, then, it is well to exclude these conditions. If none of them is present, the child may be turned. The only difficulty is to keep the child in its new position. If the turning is done some time before labour begins, the pelvic presentation will recur. The best time to perform version is after labour has started, but before the breech is fixed, or the membranes have ruptured. Then turn the child by external version (*v.* page 555), and apply a tight binder to keep it in its place, or rupture the membranes if the os is sufficiently dilated.

(2) If a pelvic presentation is allowed to persist, the treatment of the case is sometimes difficult. There is a general rule for the treatment, during the first stage of labour, of all abnormal presentations, namely, to avoid anything that may increase the liability of the membranes to rupture prematurely. It has been already explained how it is that premature rupture of the membranes is the rule in these cases, and, in a

pelvic presentation especially, the prognosis for the child is worse the earlier the membranes rupture. The indication, then, is to keep the patient in bed during the first stage, also to avoid vaginal examination, at any rate during a pain, and not to permit the patient to bear down until after the membranes have ruptured. There is no further special treatment required until the breech appears at the vulva. As the breech slips from behind the perinæum, the attitude of the physician is one of "watchful expectancy." There is little to be done in an ordinary case, except to lift out the feet as they come, in order that they may not catch in the perinæum. It is worse than useless to attempt to express a breech, as we do a head, by pressure from behind the anus, as any attempt merely results in pushing it back into the vagina. Delivery is left to nature until the child is born as far as the umbilicus; then a loop of the cord is gently drawn down, and the patient is turned upon her back and placed in the cross-bed position. There are two reasons for thus drawing down the cord:—

(*a*) As the body descends, it compresses the cord against the brim of the pelvis. This pressure may be sufficient to prevent the cord descending *pari passu* with the descent of the body. The result of this is, that extreme tension of the cord occurs, between the umbilicus of the child and the portion of the cord which is caught at the brim. This tension may be so great as to cause the cord to tear.

(*b*) If we draw down a loop of the cord and observe its pulsations, we have an exact indication of the condition of the child.

The patient is now on her back, and everything going on favourably, *i. e.* the cord is pulsating. The next uterine contraction should drive the child out with the exception of its head, or perhaps expel it completely. If the head of the child is not expelled by the same pain which expels the shoulders, then assistance must be rendered, as will be shown afterwards. If we can wait sufficiently long to allow the uterus to expel the body of the child, there is little fear of the arms becoming extended above the head. The uterine contractions acting from behind expel the body, and, at the same time, keep the arms folded across the chest. But in some cases we cannot wait for the uterine contractions, and, when pressure on the fundus has failed, we are obliged to pull upon the body of the child in order to deliver it more rapidly. Then, as a result, the arms are caught at the pelvic brim, and become extended above the head.

The cases in which we cannot wait for the uterus to expel the child are those in which the cord is not pulsating, or pulsating very feebly, when drawn down. The child is then obviously exposed to the danger of asphyxia, and must be delivered as rapidly as possible. In accomplishing this, the skill and quickness of the accoucheur may be tested to the full, and upon them the life of the child depends. Always remember the great difference that exists between the expulsion of the child by pressure from behind, and the extraction of the child by pulling from below. If the arms become extended, the time necessary for the delivery of the case is increased. Never pull upon the body until you have first tried

to express the child by pressing upon the fundus. It is only when this fails that traction is to be made on the body. If this course of action is necessary, seize the child by the pelvis and draw it downwards as far as possible, while an assistant at the same time presses upon the fundus. The arms usually become extended, and must be brought down before the head can be delivered.

As the child lies in one of the oblique diameters of the pelvis, one arm is posterior and the other anterior. It is better to bring down the posterior arm first, as there is more room for the operator's hand and arm in the hollow of the sacrum, than there is behind the symphysis. To bring the arm down, the body of the child is drawn forwards, towards the mother's abdomen, and as much of the hand as necessary is passed into the vagina, with the palmar surface towards the back of the child. The hand which naturally corresponds to the side towards which the face is turned is used. The fingers are then slipped upwards along the arm until the elbow is reached (*v.* Fig. 105). If the forearm is flexed, hook the fingers into the angle of the elbow, and draw it gently downwards over the chest. If the forearm is extended the fingers must be passed below the elbow and hooked over the extensor surface of the forearm; then, pressure upon the latter causes it to flex, and so to sweep downwards over the face and chest. The posterior arm is thus delivered, and next the anterior arm must be brought down if it is extended. It may be brought down as an anterior arm, or, better, the body may be rotated in such a direction that the anterior shoulder

travels in the direction of the back of the child. Rotation is continued until the arm lies posteriorly, and it is then brought down, in a similar manner to the former arm. In some cases an arm may have become so twisted as to lie behind the neck of the child—nuchal position of the arm. If this happens, the arm may be set free by rotating the body; but, if this fails, it may have to be fractured before it can be brought down.

Great care must be taken in bringing down the

Fig. 105.—Pelvic presentation. The mode of bringing down the posterior arm. (*Farabeuf.*)

arms to avoid fracturing the humerus or clavicle. The former is most usually broken by attempting to bring the arm down with the fingers upon the middle of the humerus, instead of below the elbow. The clavicle sometimes breaks, when we imagine we are doing everything correctly. The fracture is probably caused by the head of the humerus, as it rotates, being pressed inwards by the pelvic brim, and so tending to make the ends of the clavicle approximate one another.

As soon as the shoulders are born, the delivery

of the head must follow as rapidly as possible. It is not alone in cases in which traction on the trunk of the child has been made, that the head requires to be delivered artificially. Whenever the head is not expelled by the same contraction that expels the shoulders, it will require assistance. The reason of this is manifest. When the shoulders are born, the head has left the uterus and is lying in the vagina; accordingly, the uterine contractions have no power to expel it. The head must never be allowed to remain in the vagina for a moment longer than is necessary. The cold air chilling the body of the child, and the commencing asphyxia, cause premature attempts at inspiration, and mucus and meconium are sucked into the lungs. Further, if the cord has not been compressed up to this point, it is now certainly compressed by the head. And, lastly, as the fœtus has left the uterus, the placenta is very probably in process of being detached.

There are three good methods of delivering the after-coming head :—

(A) A modification of the Prague method.
(B) Martin's method.
(C) Smellie's method.*

Before describing them we must insist on one point. The head must be brought into a position of flexion, before any attempt at extraction is attempted.

(A) **A Modification of the Prague Method.**—This is the quickest and simplest method of delivering the head, if it is in the pelvis; it is of little value when the head is above the brim. Standing at the patient's

* This method—usually known as the Veit-Smellie method—is described in full by Smellie in his 'Midwifery,' part iii, case 303.

right side, the fingers of the left hand are hooked over the shoulders, and the feet are seized in the right hand (*v.* Fig. 106). The shoulders of the child are drawn directly upwards by the left hand, and detained in this position throughout the extraction; by this means the pressure of the symphysis upon the occiput causes flexion of the head. With the right hand, the body of the child is then swept

Fig. 106.—Pelvic presentation. A modification of the Prague method of delivering the after-coming head.

forwards and upwards over the mother's abdomen, and the head, rotating round the point of the occiput which is fixed beneath the symphysis, is born.

(b) **Martin's Method.**—This method is suitable for all cases, whether the head is above or below the brim. With the patient in the cross-bed position, the obstetrician, standing in front of her, places the arm corresponding to the side towards which the face

of the fœtus is turned, *i. e.* the right arm when the face is on the left and *vice versâ*, beneath the body of the fœtus, so that the latter lies straddle-wise upon it. As much as is required of the hand is then introduced into the vagina, the mouth is found, and two fingers introduced as far back as possible. This last precaution is necessary in order to avoid fracture of the jaw. The head is so guided by the fingers in the mouth that its antero-posterior diameter lies in the oblique diameter of the pelvis,

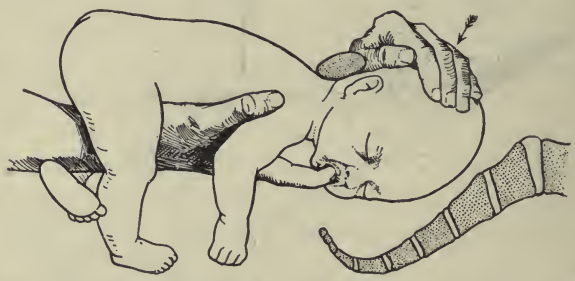


Fig. 107.—Pelvic presentation. Martin's method of delivering the after-coming head.

or, in the case of a flat pelvis, in the transverse, and at the same time it is pulled down into a position of flexion. The other hand is then placed on the fundus, and by means of pressure on the occiput, in such a manner as to cause flexion, the child is delivered (*v.* Fig. 107).

(c) **Smellie's Method.**—This is also suitable for any case, and is the most powerful method for extracting the head which we have at our disposal. The fingers of one hand are introduced into the mouth as in Martin's method, whilst the fingers of the other

hand are placed over the shoulders as in the Prague method. Flexion is obtained by jaw traction; whilst, to deliver, traction is applied both on the shoulders and the jaw. If the head is above the brim, we must first pull backwards and downwards, *i. e.* in the axis of the brim; then directly downwards; and then forwards, at the same time carrying

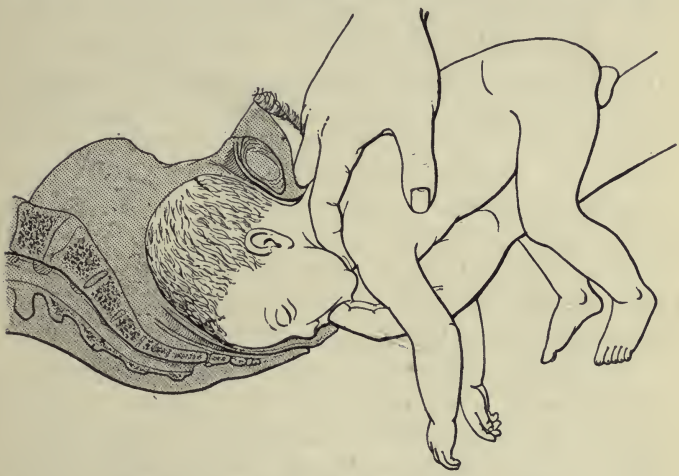


Fig. 108.—Pelvic presentation. Smellie's method of delivering the after-coming head.

the body of the child as it lies on the arm upwards over the mother's abdomen (*v.* Fig. 108).

The application of the forceps to the after-coming head only deserves a passing mention. It will without doubt extract the head, but it requires time for application, it is not always ready, and no more power can be obtained by it than by Martin's or Smellie's method. Consequently, it is better to accustom ourselves to the simplest method. If the

forceps is used, it is locked under the body of the child, and traction applied in the axis of the pelvis.

If the face rotates anteriorly, there are two ways of delivering the head; the first is the better method for those cases in which the face of the child is lying behind the symphysis, *i. e.* in the pelvic cavity. To perform it, carry the body of the child well backwards. By this means the chin is drawn down from behind the symphysis. If the face does not follow easily, introduce the fingers into the mouth and apply traction, so that the face rolls out from behind the symphysis, the forehead following, and lastly the occiput. The other method is just the reverse of this, and is more suited to those cases in which the chin catches above the symphysis. The body of the child is carried well forwards, so that the occiput rolls out over the perinæum, the forehead following, and lastly the face.

Prognosis.—The mortality as far as the mother is concerned is no worse than in a vertex presentation; the fœtal mortality is, however, considerably higher. It is given variously as one in four and one in eleven. The longer the membranes remain intact, the better will the os be dilated, and the quicker will be the passage of the head through the pelvis.

CHAPTER XII.

TRANSVERSE PRESENTATION.

Frequency—Ætiology—Positions—Diagnosis—Mechanism; Spontaneous Evolution, Spontaneous Version, *Corpore Conduplicato*—Treatment.

Transverse presentation, cross-birth, and oblique presentation, are the different terms applied to the presentation of the fœtus, when it lies in the uterus in such a manner that neither pole presents (*v.* Fig. 110). Strictly speaking, a transverse presentation only occurs when the fœtus lies with its head at one side of the uterus, and its breech directly opposite. Similarly, an oblique presentation occurs when the fœtal head or breech lies in one hypochondrium, the other pole being in the opposite iliac fossa.

Frequency.—The relative frequency of transverse presentation is very variously stated by different writers. In these countries it is said to occur about once in 243 labours. At the Rotunda Hospital the relative frequency of transverse presentation amongst 24,818 cases of immature, premature, and full term labour was one in 377·54, *i. e.* 0·27 per cent.

Ætiology.—Any condition which causes a variation from the normal shape of the uterus or pelvis favours a transverse presentation. The principal of

these conditions are :—contracted pelvis ; large lax uterus ; hydramnios ; twins ; placenta prævia ; and tumours of the uterus, as myomata. Abnormalities in the shape or size of the child, will also favour a

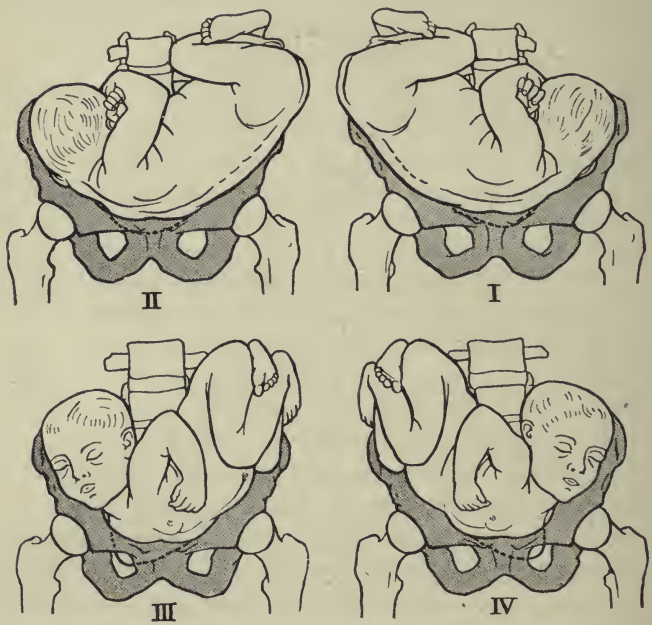


Fig. 109.—The four positions in which the fœtus may lie in shoulder presentation.

transverse presentation, as :—a very large fœtus ; a very small or premature fœtus ; tumours on the body of the child ; and double monsters.

Positions.—Four positions are recognised :—

1st position—back in front, head to the left.

2nd position—back in front, head to the right.

3rd position—back behind, head to the right.

4th position—back behind, head to the left.

The first and second positions are the most common.

Diagnosis.—**Abdominal Palpation.**—A transverse presentation can readily be diagnosed by this means. At the commencement of labour the pelvic brim is

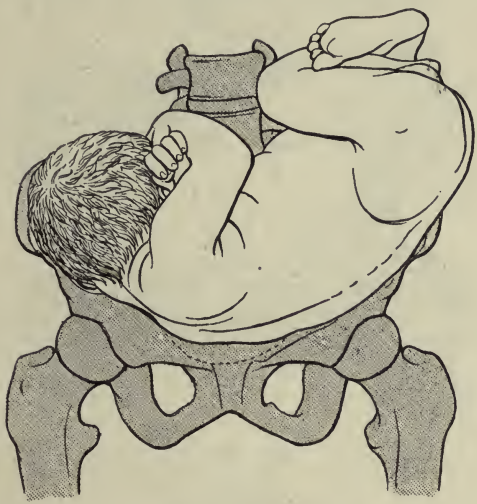


Fig. 110.—Transverse presentation. Fœtus in the second position. (*Farabeuf.*)

found to be empty; the head is felt at one side of the abdomen, and the breech at the opposite.

The position of the fœtus is ascertained by noting whether the back is turned forwards or backwards, and the head to the left or the right.

Vaginal Examination.—The presenting part cannot be felt at first. The membranes protrude unduly into the vagina during a pain. If the case has become

a so-called neglected shoulder presentation, the shoulder can be felt, a few of the ribs, and the arm prolapsed into the vagina (*v.* Fig. 111). The arm is recognised as already mentioned (*v.* page 239). To decide whether it is the right or left arm,

Fig. 111.—Transverse presentation. So-called neglected shoulder presentation. (*Farabeuf.*)

imagine yourself shaking hands with it. If your hand lies palm to palm with it with the thumbs together, it is the right or left, according as the hand you are examining with is right or left. It must not be forgotten that, although in a neglected transverse presentation the shoulder is practically always driven down into the pelvis, still at the com-

mencement of labour other parts of the body of the fœtus may present. The middle of the back may lie lowest, or a foot and a hand may come down together.

The position of the fœtus is ascertained by noting the side of the pelvis at which the presenting shoulder lies, and whether the back is turned forwards or backwards.

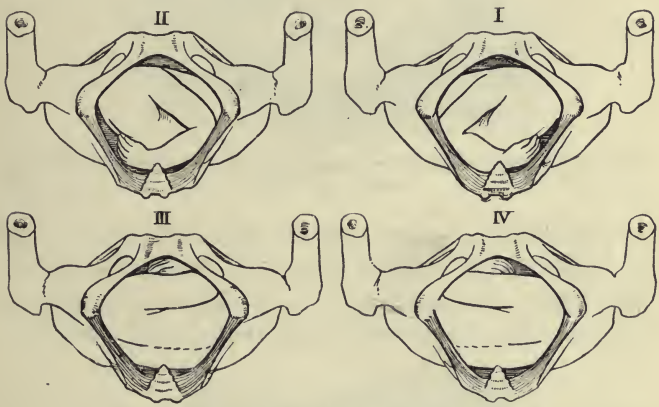


Fig. 112.—The four positions of the fœtal trunk in transverse presentation, as felt from below.

Mechanism.—Transverse presentation, like brow presentation, must never be allowed to remain unchanged, except, perhaps, in the case of very small or macerated infants. Such infants can sometimes be delivered by the natural efforts in one of three ways :—

(1) By spontaneous version.
(2) By spontaneous evolution.
(3) *Corpore conduplicato.*

(1) *Spontaneous version* occurs when the present-

ing shoulder is pushed away from the os by strong uterine contractions, and the head or breech takes its place. Delivery is then usually rapid.

Fig. 113.—Transverse presentation. Spontaneous evolution, first stage. (*Norris.*)

(2) *Spontaneous evolution* occurs as follows :—The shoulder of the child is driven down into the pelvis, and the corresponding arm prolapses out of the vagina. The shoulder then becomes fixed under the

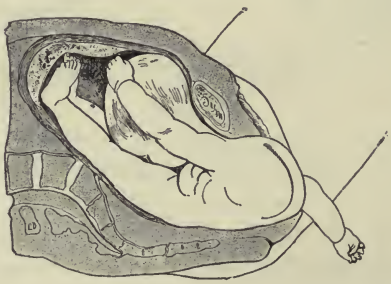


Fig. 114.—Transverse presentation. Spontaneous evolution, second stage. (*Norris.*)

symphysis, while the back, acutely flexed, gradually appears from above the perinæum. The breech follows, and the lower limbs ; the last part to be

born is the head and remaining arm (*v.* Figs. 113 to 116).

(3) Expulsion *corpore conduplicato* is an extremely

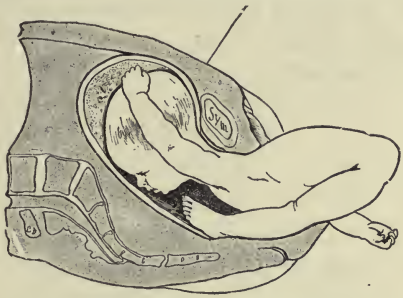


Fig. 115.—Transverse presentation. Spontaneous evolution, third stage. (*Norris.*)

rare occurrence, and is only possible in the case of a very premature fœtus, or of one which is in an advanced condition of maceration. The shoulder which presents is driven down into the pelvis,

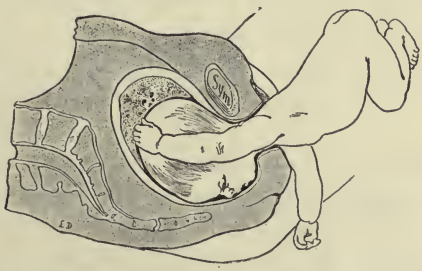


Fig. 116.—Transverse presentation. Spontaneous evolution, final stage. (*Norris.*)

closely followed by the head and the rest of the trunk; the head and chest thus descending together (*v.* Fig. 117).

Treatment.—A cross-birth must be treated in one of four ways :—

(1) Postural treatment.
(2) External cephalic version.
(3) Internal or bi-polar podalic version.
(4) Embryotomy.

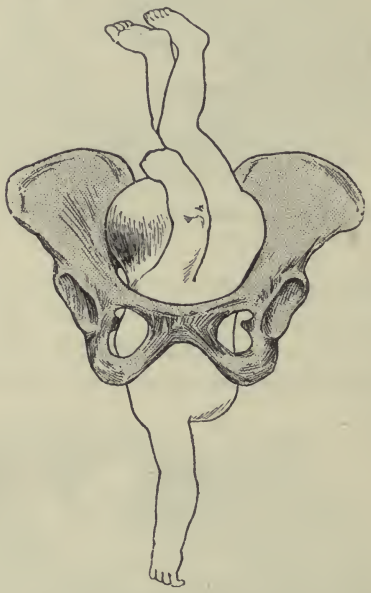


Fig. 117.—Transverse presentation. Birth *corpore conduplicato* (*Küstner.*)

(1) Postural treatment is often sufficient in cases of slight obliquity of the fœtus. To be of service, the membranes must be unruptured, and a limb must not be prolapsed through the os. We must first understand the reasons on which the method is based. When the patient lies upon her side, the

fundus of the uterus falls over to that side under the influence of gravitation, carrying with it whatever pole of the fœtus it contains, and so causing a corresponding elevation of the opposite pole. Accordingly, if the head is in one iliac fossa, and the patient lies on the same side, the breech will fall towards that side, and the head will rise towards the opposite side.

(2) External cephalic version requires similar conditions to the previous method. It is to be used when the obliquity of the fœtus is too great to be corrected by postural treatment. It will not always be successful, as the child tends to slip back to its original position. It should, however, always be given a trial, if the case is seen in time, as, if successful, it gives the child a better chance of life. It is useless to attempt this form of version until the patient is in labour, as, otherwise, the head would not fix, and the malpresentation would recur. The child is turned by external version until the head comes over the brim; the membranes are then ruptured and the head held there until it is fixed, or a tight binder is applied to keep it in its place (*v.* page 555).

(3) Internal podalic version, unless directly contra-indicated through fear of causing rupture of the uterus, must be adopted in all cases in which external cephalic version has failed, or in which the necessary conditions for performing it are not present. Any form of version is contra-indicated in cases of neglected shoulder presentation in which a considerable portion of the child has been expelled out of the uterus, or in which the contraction ring is

more than 2½ inches above the symphysis (Winckel). Version may also be impossible to perform, owing to the force with which the child has been driven into the pelvis. When the leg of the child has been drawn down into the vagina, it is well to leave the further expulsion to nature, unless there is an indication for immediate delivery (for the methods of performing version, *v.* page 555).

(4) Embryotomy is indicated in a neglected shoulder presentation :—

(*a*) When podalic version is contra-indicated owing to the condition of the uterus.

(*b*) When podalic version is impossible.

(*c*) When podalic version is difficult and the child is dead.

Decapitation is the best mode of procedure (*v.* page 589). If the neck cannot be reached, evisceration must be performed (*v.* page 590).

We may sum up the treatment of transverse presentation in a few words. If the case is seen early in labour, and there is only a slight obliquity of the fœtus, try postural treatment. If this fails, perform external cephalic version, unless some complication, such as contracted pelvis, calls for a pelvic presentation, in which case perform podalic version. If the case is not seen until after the membranes have ruptured, perform internal podalic version, unless the condition of the uterus forbids it, in which case decapitation or evisceration must be performed.

Prognosis.—The fœtal mortality is very high. About 33 per cent. of children alive at the commencement of labour are born dead. The maternal mortality is said to be about 5·5 per cent. (Winckel).

CHAPTER XIII.

MULTIPLE PREGNANCY.

Varieties—Frequency—Twin Pregnancy—Ætiology—Diagnosis—Presentations—Course of Labour—Treatment—Prognosis—Complications: Locked Twins, Entangling of the Cords, Fœtus Papyraceus.

Multiple pregnancy is the term applied to the presence of two or more children in the uterus.

Twin pregnancy may occur in two ways. Either one ovum contains two nuclei both of which become fertilised, or two separate ova may become fertilised. In the former case, the children are of the same sex, there is but one placenta and one chorion, but there are two amnions. In the latter case, the children may or may not be of the same sex, there are two placentæ, two chorions, and two amnions. It must not be forgotten that two placentæ may grow in such a position that their edges coalesce, and so there may appear to be but one placenta. The nature of these cases is shown by the fact that there are two chorions.

Frequency.—Twins occur, approximately, once in 88 births, triplets once in 7820, quadruplets once in 366,012; quintuple births and sexlets have been recorded. At the Rotunda Hospital amongst

24,818 cases of labour, the relative frequency of twins was one in 76·68, *i. e.* 1·3 per cent., and of triplets one in 6447·5, *i. e.* 0·01 per cent.

Diagnosis.—The only certain way to diagnose twins is for two observers to count the fœtal hearts

Fig. 118.—Twin pregnancy. (*Galabin.*)

at the same time, and to find that their results do not correspond. If monsters are excluded, twins can also be diagnosed by palpating two heads, two backs, more than two large parts (viz. a head or breech), and more than four limbs.

Presentations.—Abnormal presentations are relatively more common in multiple than in single

pregnancies. The following table shows the relative frequency of the different presentations :—

Two head presentations occur in	49·00	per cent.	of twin pregnancies.
A head and a breech	„	31·70	„	„
Two breeches	„	8·60	„	„
A head and a transverse	„	6·18	„	„
A breech and a transverse	„	4·04	„	„
Two transverse	„	0·35	„	„

(*Spiegelberg.*)

The usual course of labour is, that after the birth of the first child comes the second child, then the placenta of the first child, and then the placenta of the second child. In a small proportion of cases the first child is followed immediately by its placenta, and then comes the second child and its placenta.

Treatment.—Having diagnosed the presentation of the first child there is nothing further to be done but to allow it to be born naturally. Then palpate the presentation of the second child, as the latter may lie transversely. If so, correct the presentation. Rupture the membranes of the second child about thirty minutes after the birth of the first, if they have not already burst spontaneously. This is always necessary, otherwise the second child might be retained in the uterus for some hours or even some days. Twins are frequently premature, and when the over-distended uterus has been relieved, by the birth of one child, it may lose its irritability. Cases have been recorded in which the second twin has been retained for a fortnight, or even more, after the birth of the first. Indeed, some writers have advised, in cases in which the placenta of the first child follows it, to put on a binder and keep the patient quiet, in the hope that the second child

may not be born until full term. This treatment, however, exposes the woman to all the pain and expense of a second confinement, and, save under very exceptional circumstances, does not appear to be justifiable. The object of waiting for thirty minutes after the birth of the first child, before rupturing the membranes, is to give the uterus a temporary rest, and so to minimise the danger of atonic post-partum hæmorrhage.

Prognosis.—The prognosis in twin pregnancy is little worse, for the mother, than in a single pregnancy. For the children, the prognosis differs according to the presentation. But, as the children are usually small, and the maternal parts, at any rate for the second child, are well dilated, the mortality is less than the same abnormal presentation would cause in a single pregnancy. Many twins, though born alive, die during the first month of their existence, as a result of their premature birth.

Complications.—Dystocia, *i. e.* difficult labour, may arise in twin pregnancy owing to the children becoming interlocked during birth. It may occur in three ways :—

(1) Two very small heads enter the pelvis at the same moment; rotation is thus prevented, and further delivery without assistance is impossible. The treatment consists in endeavouring to push up one head, so as to allow the other to descend. If the latter does not descend, the forceps must be applied. In very rare cases perforation may be necessary.

(2) Both children present by the head, one a little

in advance of the other. The head of the second child is driven down against the neck of the first, and so prevents any further descent. In such case, the head of the second must be pushed up, and the first extracted by forceps.

(3) The first child presents by the breech, and is partially born. The second child presenting by the head enters the pelvis in such a manner that its chin becomes locked under the chin of the after-coming head of the first child. In such cases, if the second head cannot be pushed up, an attempt may be made to extract it with forceps past the body of the first child. If this fails, or if the first child is dead, the latter should be decapitated, its head pushed up, and the second child expressed or extracted by the forceps. In any of these cases in which decapitation or perforation is necessary, the first child should be selected for operation, as it is most probably dead.

Entangling of the cords sometimes happens in multiple pregnancy. As a result, one or both children may die *in utero*. Also, during the birth of the first child, the cord of the second may be pulled down into a sharp angle, and so circulation through it be prevented. Lest this accident should happen, the cord of the first child should never be pulled upon.

A *fœtus papyraceus* is formed when one child dies *in utero*, but the other lives. As no germs gain access to the dead child the latter does not putrify, but shrivels up and becomes mummified. The growing child then presses against it, and flattens it out against the uterine wall; and it is found, after birth, adherent to the membranes.

CHAPTER XIV.

THE PUERPERIUM.

Physiological Phenomena—The Involution of the Uterus—The Lochia: Varieties, Amount—Lactation: Amount, Composition of Milk—Prognosis—Treatment—Complications: Subinvolution.

The puerperium is the term applied to the period during which the woman is recovering from the effects of pregnancy and childbirth. During the puerperium the parturient canal is returning to its normal condition, and lactation is being established.

Phenomena.—There are certain phenomena to be considered which are peculiar to this period. These are :—

(A) The involution of the uterus.
(B) The lochial discharges.
(C) The establishment of lactation.

(A) **Involution.**—The uterus takes six weeks to return to its normal non-impregnated condition. Immediately after delivery it weighs from 24 to 48 ounces, and this has to be reduced to the normal weight of 9 to 10 drachms (Heschl). This process of involution is caused chiefly by the diminution that occurs in the blood-supply of the uterus after

delivery. The uterus, contracting tightly, compresses and obliterates the greater number of its nutrient vessels. The enlarged muscle-fibres were formerly said to undergo a fatty degeneration, and to come away in the lochia as fat droplets. This explanation, however, has been almost universally abandoned, and, instead, three other explanations have been offered. The first of these is that the fibres are absorbed and carried away in the lymphatic circulation, their place being taken by smaller fibres, similar to the original fibres of the non-impregnated uterus. The second, offered by Helme, is that the process of involution is one of atrophy, which results in a diminution in bulk of each fibre, probably by a process of solution, and that there is no new formation of smaller fibres. The third explanation, offered by Sänger, is that the changes in the fibres are due to a hyaline and finely granular degeneration, and that the products of degeneration are oxidised in the uterus and do not find their way into the maternal blood. As the muscle-fibres involute, the remains of the decidua disappear, and the normal mucous membrane returns. This process is complete at or shortly before the eighth week after delivery.

As the uterus involutes, it decreases in size. At the fourth day, the fundus should be just below the level of the umbilicus, by the tenth day it should lie behind the symphysis, the posterior surface of the body occupying the plane of the brim, and, by the fifteenth day, the uterus should be entirely a pelvic organ (Webster).

(B) **The Lochia.**—The lochia are the term applied to the discharge which comes away during involution

of the uterus. In a normal case, in which there is no bacterial infection of the vagina, this discharge is akin in character to the discharge from an aseptic granulating surface, and consists at first of pure blood, then blood and serum, and finally serum alone. Blood should have disappeared by the sixth day. Mingled with the discharge are found fragments of decidua and membranes, the products of fatty degeneration of the decidual tissue, and mucus from the cervical glands. If care has been taken to maintain the aseptic condition of the vagina, bacteria will be absent; otherwise saprophytic and pyogenic bacteria will be found. The average amount of lochia under normal circumstances is about eleven ounces, and the average duration of the discharge is about eight days (Giles). The quantity is said to vary directly with the weight of the child, the size of the placenta, and the usual amount of the menstrual flow, and inversely with the amount of blood lost during labour. The normal odour of lochia is that of the blood it contains, and any putrid or fœtid odour is pathological.

(c) **Lactation.**—The fluid which is found in the breast during the first forty-eight hours after delivery is termed *colostrum*. The milk proper becomes established about the evening of the second, or the morning of the third day, and rapidly increases in amount. The quantity of milk which a woman secretes, and the rate of increase during the first seven days, are as follows:—

Day	1	2	3	4	5	6	7
Amount in ounces	0	3⅓	7	8¼	13	15	17½

(*Winckel.*)

The average daily quantity of milk secreted at different periods of lactation is as follows :—

At end of 1st week	10 to 16 ounces
During 2nd „	13 „ 18 „
„ 3rd „	14 „ 24 „
„ 4th „	16 „ 26 „
From 5th to 13th week	20 „ 34 „
„ 4th „ 6th month	24 „ 38 „
„ 6th „ 9th „	30 „ 40 „

(*Holt.*)

Tables showing the average composition of colostrum and of human milk will be found in the chapter on infant feeding (*v.* page 601).

Prognosis.—We can tell whether or not the patient is progressing favourably during the puerperium, by inquiring into certain points. They are as follows :—

(A) **Aspect.**—The aspect of the patient is of the greatest importance. If her condition is satisfactory, there should be no change from what it is under ordinary circumstances. In any septic condition, her face becomes drawn and pinched, and has a yellow tinge; the angles of the nostrils are drawn down; and the whole appearance is altered.

(B) **Sleep.**—The amount of sleep the patient has had, is also a most important index to her condition. Sleeplessness is often one of the first indications of commencing sepsis; and, on the contrary, if the patient sleeps well, she generally is progressing favourably.

(C) **Temperature.**—Slight variations of temperature are very common during the puerperium, so that any temperature which does not exceed 100·5° F. (38° C.) in the axilla may be considered as normal. Any rise above that, points to some abnormal condition.

(D) **Pulse.**—The pulse ranges between 50 and 90

beats per minute, and usually averages from 60 to 70. It is often a most important aid in the diagnosis of sepsis. If the temperature rises, but the pulse remains tolerably normal, the condition in all probability is not serious.

(E) **Milk.**—The milk should flow freely, after the second day; its sudden cessation points to septic infection.

(F) **The Lochial Discharges.**—Normal lochia should flow freely at first, and cease gradually. Sudden stoppage sometimes corresponds with the onset of sepsis. The colour should change according to the day of confinement, as has been already mentioned. If the lochia are sanguineous after the sixth day, it shows that some degree of sub-involution is present. Any putrid odour is pathological. The stain on the napkin caused by healthy lochia, differs considerably from the stain caused by putrid lochia. The former is red in the centre and fades away towards the edge, which is colourless. The latter is not so red in the centre, but becomes of a deeper red towards the edge, which is also clearly defined.

The relative value of these points is well brought out in the following words:—"If a patient with a high temperature looks well, sleeps well, and says she is well, she is at any rate not septic." "If a patient with a high temperature looks very ill, sleeps very badly, and says she feels very ill, she generally is very ill." "If a patient with a high temperature looks very ill, sleeps very badly, but says she is very well, she will probably die" (Smyly). The last condition is known as *euphoria*, and will be described under acute sepsis (*v.* page 506).

Treatment.—The treatment of the patient during the puerperium, is best considered under certain headings :—

(A) **Rest.**—As soon as the patient has been delivered and comfortably settled, she should be kept perfectly quiet, and allowed to sleep if she can. During the first few days, she will probably spend the greater part of her time in this manner. She should be kept in bed until at least the seventh day, and, if possible, until the tenth or twelfth. In any case, she must not be allowed to get up until all traces of blood have disappeared from the lochia, as often sub-involution and retroflexion are caused by doing so.

(B) **Diet.**—For the first two days the patient is kept on light nutritious food ;—beef-tea, gruel, milk, tea and toast, and egg well beaten up,—anything of this nature may be given. After this, the diet is more liberal, and, if her bowels have moved, she may have any ordinary digestible food. Stimulants are not necessary unless the patient is very weak. If she is in the habit of taking them regularly, it may be advisable to continue them.

(C) **Bladder.**—The bladder should be emptied within six hours after the confinement. It is occasionally impossible to get the patient to pass water, as the recumbent position, and the presence of slight lacerations and bruises about the urethra, combine to prevent her. If the patient cannot pass water in the recumbent position, even after hot stupes and pressure over the bladder have been tried, she should turn on her hands and knees, and endeavour to do so in this position ; or she may sit up after the fourth day. If, as a last resource, the catheter must be

passed, the parts must be thoroughly washed, the urethra exposed, and the catheter passed by vision, not by touch. Only a metal or glass catheter should be used, on account of the difficulty of sterilising the other forms. There is no great risk in passing a catheter on the first or second day after confinement, but after this the risk is greatly increased. The lochia may then contain bacteria, and if they are carried into the bladder, a severe cystitis may start.

(D) **Bowels.**—The usually accepted idea is that the patient should not get a purgative until the third day. Most patients are, however, much relieved by, and considerably the better for, a purgative on the evening of the second day. Castor oil (℥j—℥ij), Liquid Extract of Cascara Sagrada (℥j—℥ij), or Sulphate of Magnesium (℥ss) may be given. An aperient should be administered every second day during the puerperium, if the bowels do not move of themselves.

(E) **The Vulva.**—The importance of maintaining the asepsis of the vulva, subsequent to delivery, has been already mentioned (*v.* page 5), and the remarks then made may be regarded as applying to the entire puerperium. The best method of maintaining the asepsis of the vagina, consists in keeping the vulva covered by a sterilised pad of cotton wool, or by a sanitary towel soaked in an antiseptic such as biniodide of mercury, and this pad covered in turn by a layer of absorbent wool. These pads must be changed as often as the lochia soak through the outer covering ; and this, during the first couple of days, will usually occur every two or three hours.

Subsequently, it will be sufficient to change them every six or even every twelve hours. If it is improbable that the patient will receive careful nursing, it is better to avoid the use of any pad over the vulva, as it is preferable that the lochia should escape freely on to a draw-sheet than that they should be allowed to remain in contact with the vulva after decomposition has commenced. Whenever a pad is changed, the labia should be separated and the vulva and vaginal orifice washed with a warm antiseptic lotion, but vaginal or uterine douching is contra-indicated in a normal case.

Finally, we urge the advisability of examining the patient bi-manually about a fortnight or three weeks after delivery. Such an examination is a most proper and necessary precaution. Even in cases in which the puerperium has been apparently normal, backward displacement of the uterus may occur. If this displacement is corrected, and is kept corrected by a suitable pessary, as a rule no evil effects will follow, and it will be possible to remove the pessary in three or four weeks. If, on the other hand, the displacement is allowed to persist, a condition of chronic backward displacement will probably result, and will be the more difficult to cure in proportion to the length of time for which it is left unrelieved. If, on making an examination, a displacement is found, the uterus must be replaced, a suitably sized Smith-Hodge pessary inserted, and the patient again examined in a day or two to see if the uterus remains in a normal position. The pessary may, as a rule, be removed in three or four weeks. If the uterus then remains in

a normal position, the need for the pessary is over. If, on the other hand, the uterus again falls back, the pessary must be replaced.

Complications.—The complications to be feared during the puerperium are :—hæmorrhage, sepsis, and sub-involution. Each of these will be discussed later.

CHAPTER XV.

THE DISORDERS OF PREGNANCY.

Morning Sickness—Hyperemesis—Nephritis Gravidarum—Anæmia — Hydræmia — Varicose Veins — Hæmorrhoids — Salivation—Pyrosis—Pruritus Vulvæ—Neuralgia.

MORNING SICKNESS.

The commonest of the disorders of pregnancy is, perhaps, the nausea or vomiting of the early months, the so-called morning sickness.

Ætiology.—Morning sickness is said to be reflex in origin, and has been ascribed by Rheinstädter to the passive movements of an enlarged uterus against the intestines. It is more likely to be due to the hypersensitive condition of the patient, a condition which renders her prone to have her mental or physical equilibrium upset by slighter causes than would be the case if she were not pregnant.

Symptoms.—The severity of morning sickness varies very much in different persons. In some it is little more than a slight sense of nausea, whilst in other cases—happily rare—it may reach such a pitch that the gravest result is to be apprehended. It is then known as hyperemesis, and becomes one of the severest diseases of pregnancy.

Treatment.—In its mild form, morning sickness requires little treatment ; the regulation of the bowels is generally sufficient. A teacup of very hot water the first thing on awaking, or a light breakfast in bed at 7.30 a.m. or 8.0 a.m., consisting of a cup of tea and a small piece of dry toast, will usually overcome any tendency to vomit. If this is not enough, the administration of bicarbonate of soda, subnitrate of bismuth, aromatic spirits of ammonia, or of a pill containing one-quarter of a grain of calomel and of ipecacuanhæ may be tried. Sips, or sometimes large draughts of hot water, or an effervescing mixture containing hydrocyanic acid, are also of considerable value.

HYPEREMESIS GRAVIDARUM.

Hyperemesis gravidarum is the term applied to the vomiting of pregnant patients, when such vomiting becomes excessive.

Frequency.—At the Rotunda Hospital amongst 25,790 patients the relative frequency of hyperemesis was one in 1225·71, *i. e.* 0·08 per cent.

Ætiology.—The ætiology of hyperemesis gravidarum is still far from settled. Some writers consider that it is often the result of hysteria or other neuroses, others attribute the condition to displacements of the uterus, or inflammatory conditions of the cervix. We prefer to divide cases of hyperemesis into two classes :—mild cases, and severe cases. The former are in all probability due directly or indirectly to such conditions as uterine displacements, erosion and ectropion of the cervix,

hysteria, neglected morning sickness, etc. The latter are most probably due to an auto-intoxication, the result of the failure of the eliminatory functions of the body. The cause of this failure may be some disturbance of the digestive functions, such as occurs when neglected morning sickness is associated with extreme constipation, and in renal disease when the secretion of urine is greatly diminished.

Symptoms.—The patient vomits so constantly that no food can be retained in the stomach. She is reduced to a skeleton, and, unless the vomiting can be checked, death results. In serious cases there is also frequently albuminuria, marked diminution in the amount of urine passed, and extreme constipation.

Treatment.—The first essential in the treatment is rest in bed, the room being kept dark and warm. If this fails to check the sickness, all food by the mouth must be prohibited, and rectal alimentation substituted. Enemata of beef-juice, brandy, peptonised milk, and egg, are to be given, and sedatives may be given in a similar manner. Bromide of potassium, chloral, codeia, tincture of opium, are all recommended; but, if they are to be of use, they must be given in large doses. The patient is allowed to suck ice to relieve her thirst, or to take small sips of champagne or hot water.

If there is constipation, the bowels must be made to move as soon as possible. This may be effected by giving small doses of calomel, half a grain to a grain, repeated until the patient has had four or five grains. In some cases, a saline aperient may possibly be retained. An enema must also be given.

As soon as the bowels have moved, intestinal antiseptics, such as salol or salicylic acid, should be given in doses of ten to twenty grains. The action of the kidneys must also be encouraged by means of hot stupes, and of the skin by vapour baths. It is probable that the intra-venous infusion of normal saline solution, either directly into a vein or into the cellular tissue, would be attended with benefit in these cases, and, as their prognosis is so very bad, it may be worth trying.

Attention must also be directed to such local lesions as erosion of the cervix and retro-deviation of the uterus. Milder forms of vomiting have been entirely checked by relieving them, and, especially in the case of erosions, by painting the cervix frequently with cocaine.

In cases due to neurotic tendencies, the administration in full doses of sedatives, such as chloral hydrate, or bromide of potassium, will often check the vomiting by bringing about a depressant effect on the nervous system.

Another form of treatment is recommended by Copeman, who stated that he had cured many cases by dilatation of the cervical canal, and detachment of the membranes round the internal os. His method consists in passing the finger through the os internum, and keeping it in position for a few moments. The statistics of this method are so favourable that it certainly deserves a trial. It should be combined with the treatment of any erosion that may be present. If done aseptically, it at any rate does no harm, and may be tried before resorting to artificial abortion. It is, however, difficult to understand its

mode of action in cases of hyperemesis the result of profound auto-intoxication. If none of these methods succeeds, then nothing remains but the induction of abortion, and if this is to be of use in saving the patient's life it must be carried out in time. As it is an extreme measure, there is a natural tendency to wait too long, and then perhaps the patient is too far gone for recovery.

Prognosis.—The prognosis of hyperemesis is bad. Joulin has reported 121 cases with 49 deaths, or something over 40 per cent.

NEPHRITIS GRAVIDARUM.

Nephritis gravidarum is the term applied to disease of the kidneys occurring during pregnancy. This condition is met with under four different aspects (Dührssen) :—

(A) The kidney of pregnancy.
(B) The relapsing kidney of pregnancy.
(C) True nephritis arising during pregnancy.
(D) Chronic nephritis.

(A) **The Kidney of Pregnancy.**—The pathological condition in the kidney of pregnancy is a fatty infiltration of the epithelium, due to an anæmia, which in turn is said to be caused by spasm of the renal arteries produced by reflex stimuli from the genital tract (Dührssen, Spiegelberg). This infiltration of the epithelium permits the passage of albumen and interferes with the secretion of urine. In severe cases it may even cause total suppression of urine. Renal anæmia has been also attributed to the blocking of the renal nutrient vessels by emboli

caused by the action of some coagulation-producing ferment on the blood (Volhard).

Symptoms.—The first symptoms usually appear in the later months of pregnancy, and consist in the occurrence of headache, vomiting, and œdema of the extremities, face, and body. The urine diminishes in quantity and contains much albumen, tube-casts, renal epithelium, and a few blood-corpuscles.

Treament.—This condition of the kidney very commonly causes eclampsia, and its treatment will be described in the chapter on "Eclampsia" (*v.* page 318). The kidney as a rule returns to its normal condition after pregnancy is over, but, on the other hand, true chronic nephritis may result.

(B) **The Relapsing Kidney of Pregnancy.**—This is the term applied to that condition of the kidney in which albumen and casts are found in the urine early in pregnancy, disappear after delivery, and return with each subsequent pregnancy. The fœtus usually dies from degeneration of the placenta and is expelled. Eclampsia is of rare occurrence.

Treatment.—The treatment is similar to that of the pregnancy kidney.

(C) & (D) **True Nephritis occurring during Pregnancy, and Chronic Nephritis.**—These two conditions only differ in that the former includes cases of acute or chronic nephritis beginning during pregnancy, the latter cases of chronic nephritis in the course of which pregnancy has occurred.

Symptoms.—Both these conditions cause albuminuria, casts, and diminution of urine. They do not tend to cause eclampsia, but favour the death of the fœtus, the premature detachment of the

placenta, the occurrence of retinitis, and cerebral hæmorrhage. Chronic nephritis existing previous to pregnancy is greatly aggravated by the pregnancy. Cardiac hypertrophy is usually marked, and, in advanced cases, the secondary results of a failing heart appear.

Treatment.—The treatment is at first like that for pregnancy kidney (*v.* page 282). In severe cases, as shown by the occurrence of retinal hæmorrhage, rigors, commencing suppression of urine, threatened cardiac failure, it will be necessary to induce premature labour. If the patient does not come for treatment until she has reached the stage at which the kidneys or the heart have almost completely failed, it is not advisable to induce labour until every attempt has been made to restore their action. If this can be done, labour should then be induced.

CONSTIPATION.

Constipation is a very common occurrence, and, if allowed to persist, may lead to far-reaching ill results to both mother and fœtus. The regular action of the bowels is of importance at all times, but during pregnancy it is even more so, as the waste products of both the mother and the fœtus have then to be eliminated through the maternal system, and as the proper working of the other eliminatory organs is largely dependent upon that of the bowels. Pyrosis and flatulency are frequently associated with constipation.

Treatment.—We should always endeavour to relieve constipation by alterations in the patient's

dietary and general mode of life, rather than by the administration of drugs. If, however, it is found to be impossible to regulate the bowels by such means, laxatives must be given, or enemata, and, as a last resource, purgatives. The dietetic treatment of constipation consists chiefly in the use of such foods as leave in the intestine a considerable amount of undigested residue which, by its presence, causes a mechanical irritation of the intestinal mucous membrane. Such foods are green vegetables, wholemeal bread, stewed dry fruits or ripe fruits, salads, and fresh fruit jams and preserves. A common cause of constipation during pregnancy is an insufficient consumption of fluids, leading to a diminution in the fluid part of the intestinal secretions and a consequent dryness of the intestinal contents. In order to counteract this, the free consumption of fluids, especially water, is advisable.

If laxatives are required, perhaps the best form in which to administer them is as some of the natural saline mineral waters, such as Apenta, or Hunyadi Janos. Either of these may be given as a routine every morning on an empty stomach, in quantities of half a wine-glass to two wine-glasses. If they are not sufficient, a soap-and-water enema may be given when necessary. Other laxatives which may be found of value in particular cases are tamar indien, small doses of castor oil (ʒj to ʒiij), sulphate of magnesium (ʒ¼ to ʒj), cascara sagrada (ʒss of the liquid extract), calomel (gr. ss to gr. j repeated), aloin (gr. ½), and compound liquorice-powder (ʒss). If such doses are not sufficient the drugs must be given in purgative doses.

RETENTION OF URINE.

Retention of urine is a serious, but uncommon occurrence during pregnancy.

Ætiology.—It rarely occurs except a displacement of either the uterus or vagina brings about a mechanical interference with the normal relations of the neck of the bladder or of the urethra. The two conditions, which most commonly do this, are retro-deviation of the uterus and prolapse of the uterus or of the anterior vaginal wall (*v.* pages 310, 314).

Symptoms.—The early symptoms caused by retention are too well known to need mention; when, however, the bladder becomes much over-distended the symptoms alter, and so sometimes give rise to confusion. Such a degree of over-distension can only occur when the bladder has become an abdominal organ, as is the case in retention due to retro-deviation of the uterus. In such cases the most urgent symptom is intense pain, referred not only to the bladder, but to the pelvis generally. The pelvic pain is due to the pressure of the enlarged uterus, and to some extent masks the nature of the case. The initial desire to empty the bladder may completely pass away, and be replaced by the fancy that the bladder is empty. This notion is, to a great extent, due to the fact that the urine dribbles away involuntarily from the over-distended bladder, and that, consequently, the patient considers that "she is emptying the bladder every few minutes." To this form of incontinence, the term *ischuria paradoxa* has been applied.

Diagnosis.—The diagnosis of distension of the

bladder can be made, in a case of considerable distension, by palpation, or, in a case of slight distension, by mapping out the outline of the bladder by percussion. An over-distended bladder must be distinguished from an enlarged uterus or other tumour. This can be done from the history of the case and from the results of a bi-manual or vaginal examination. In retention due to uterine prolapse, the distended bladder will be found in the pelvic cavity.

Treatment.—In cases due to prolapse, there is usually no difficulty in passing a catheter and drawing off the urine. The prolapse must then be suitably treated in order to prevent a return of the retention. In cases of retention due to retro-deviation of the uterus, it is often very difficult to empty the bladder. The causes of this difficulty are the upward displacement of the urethral orifice, caused by the mal-position of the uterus, as this may render it difficult or impossible to pass a catheter into the orifice; the compression of the urethra by the enlarged uterus; and, even after the catheter has reached the interior of the bladder, the blocking of its eye by detached pieces of vesical mucous membrane. If, in these cases, an ordinary metal female catheter cannot be passed, a male gum-elastic catheter must be tried, and sometimes it will be possible to pass this when the other has failed. Barnes[1] recommended that "the point of the catheter, instead of being directed a little backwards under the pubic arch, be directed close up behind the symphysis. . . . It should, in the first instance,

[1] 'Obstetric Operations,' third edition, p. 273.

be passed in as far as it will go, and then, when the urine ceases to flow, withdrawn by slow degrees, when more urine will often flow as if the catheter tapped fresh pouches of the bladder." If the attempt at introduction proves unsuccessful, the patient must be placed in the knee-chest position and an attempt again made with a gum-elastic catheter. Sometimes it may be possible to lessen the pressure upon the urethra by introducing a finger into the vagina and pressing the cervix backwards. If even this attempt fails, it is usually necessary to puncture the bladder supra-pubically and to draw off the urine. To do this the needle of the aspirator is introduced in the middle line about two inches above the symphysis.

INCONTINENCE OF URINE AND BLADDER IRRITABILITY.

Slight incontinence of urine, leading to the escape of water during the act of coughing or straining, is not an infrequent condition, especially amongst multiparæ. Irritability of the bladder is also common, especially in the early months.

Causes.—Incontinence during pregnancy is caused by a relaxed condition of the sphincter, probably due to stretching and compression of the neck of the bladder during a previous pregnancy, along with the increased intra-abdominal pressure that results from the enlarged uterus. Irritability of the bladder is the result of the increased pressure to which the bladder is subjected, and is most marked while the uterus is a pelvic organ—*i. e.* up to the

end of the fourth or fifth month. After this time the uterus rises into the abdomen, and almost all its weight is taken by the abdominal wall and iliac bones; consequently, there is at once more room for the bladder to expand, and less pressure upon it.

Treatment.—Little can be done for the relief of incontinence during pregnancy. If it occurs, the patient must be warned of the importance of keeping the parts as dry and free from urine as possible, as otherwise an unpleasant erythema results. An ointment rubbed on the parts will prevent the urine from coming into contact with them. Irritability may be alleviated by the administration of tincture of hyoscyamus, and at the same time the patient ought to be advised to refrain from drinking excessive quantities of fluid, particularly such fluids as she finds by experience have a diuretic effect. When the irritability occurs during the first half of pregnancy, it is usually safe to promise that the condition will pass off in a little time.

ANÆMIA.

Normally the number of red blood-corpuscles is increased during pregnancy, but sometimes the opposite is the case. The commonest causes of this condition are bad food, bad digestion, and insufficient exercise in the open air.

Treatment.—The treatment is largely prophylactic. If any active measures are necessary, iron in some form is administered. Malt preparations containing hæmoglobin are also of considerable value. The bowels must be regulated by the use of purgatives,

and for this purpose tablets containing aloin in conjunction with ferrous carbonate are of use.

HYDRÆMIA.

Hydræmia sometimes occurs in connection with anæmia, and not infrequently causes œdema of the lower extremities and vulva. If the presence of renal disease is excluded, this condition is of slight importance, but if the labia are excessively œdematous, they may offer an obstruction to delivery, or even in some cases may become gangrenous. Unless either of these terminations is feared, the condition requires little treatment.

Treatment.—If the œdema is moderate, rest in the recumbent position and the application of lead lotion will relieve it. In case of enormous distension of the labia, it may be necessary to puncture them. The danger of this proceeding is that labour may ensue, or suppuration may occur; consequently, it should only be adopted if necessary, and then every precaution must be taken to prevent infection.

VARICOSE VEINS.

Varicose veins frequently form in the later months of pregnancy, especially in the lower limbs and about the vulva.

Treatment.—Their treatment is at first palliative, as a radical operation is contra-indicated. An elastic bandage applied to the affected limb is usually sufficient. The patient should also wear an abdominal belt to support the uterus. If the veins still

continue to increase in size, and threaten to rupture, the patient should be kept in a recumbent position. In rare cases, a radical operation may have to be performed.

HÆMORRHOIDS.

Hæmorrhoids are a very common trouble at the end of pregnancy. Usually they disappear a short time after delivery, but sometimes they persist, and give rise to such annoyance as to necessitate their removal.

Treatment.—During pregnancy the only treatment which can be adopted is to keep the motions soft and regular, and to use some soothing application, as Ung. Galli c̄ Opio. Tr. Opii in water, and suppositories containing extract of witch-hazel are also useful, and in some cases the application of a poultice or fomentation affords relief. The hæmorrhoids should be bathed frequently with warm water.

SALIVATION.

Salivation may be extremely troublesome, but it is a rare affection.

Treatment.—Desire the patient to wash out the mouth with some astringent solution, and administer internally two- to four-minim doses of Liquor Atropinæ Sulphatis.

PRURITUS VULVÆ.

Pruritus vulvæ, or irritation of the vulva, is a most distressing condition. It is usually caused by

a vaginal discharge, but may also be due to diabetes or to parasites.

Treatment.—If vaginal discharge is the cause of the pruritus, the chief treatment is cleanliness. The patient should bathe the parts twice or thrice daily with warm water, in which some mild astringent is dissolved, as borax, very dilute sulphate of copper solution, or pyroligneous acid. Vaginal douches also may be used, such as pyroligneous acid 1 in 4, boracic acid (saturated solution), or carbolic acid 1 in 80. If an erosion of the cervix is the cause of the discharge, it should be touched with pure carbolic acid or formalin ; or a solution of sulphate of copper thirty grains to the ounce, or pyroligneous acid should be applied every couple of days through a cylindrical speculum. If these manipulations are performed with gentleness, there is no fear of bringing on labour. The pruritus itself may be relieved by applying some soothing ointment, as Ung. Oxidi Zinci. This acts by preventing the discharge from coming in contact with the skin, while also it relieves the irritation.

NEURALGIA.

Various neuralgic affections are common in pregnancy, particularly in the regions supplied by the fifth cranial nerve.

Treatment.—Local application of warmth, or of camphor or chloroform liniment, will usually relieve the pain. Quinine, bromide of potash, phenacetin, antipyrin, or hyoscyamus, especially the first, are also sometimes of use.

CHAPTER XVI.

DISEASES OF THE DECIDUA AND OVUM.

Decidual Endometritis—Abnormal Permeability of the Membranes — Vesicular Mole — Chorion-epithelioma — Hydramnios — Oligohydramnios—Anomalies of the Placenta and Funis.

DECIDUAL ENDOMETRITIS.

Decidual endometritis is a most important condition, and is of by no means infrequent occurrence during pregnancy.

Varieties.—Two varieties are met with:—Acute decidual endometritis, and chronic decidual endometritis.

Acute Decidual Endometritis.—This rare condition is the local manifestation of different acute infectious diseases, in which, in consequence of the altered blood-pressure, of the presence of toxins or more rarely of bacteria in the blood, inflammatory and hæmorrhagic changes occur in the decidua. In all probability those diseases which are associated with sudden and considerable alterations of temperature are most prone to cause this condition. It is probable that in all cases in which the condition occurs, abortion results. Under the microscope there is a round-celled infiltration of the decidua, the cells of which

are increased in number and size. The infiltration is sometimes so excessive as almost entirely to hide the decidual cells themselves, and in such cases a layer of pus may cover the surface of the decidua.

Chronic Decidual Endometritis.—Chronic decidual endometritis is a condition of comparatively frequent occurrence, and is one of the commonest causes of abortion.

Pathological Anatomy.—Decidual endometritis may result in hypertrophy or atrophy of the decidua. The former change is the more common.

In the hypertrophic form, there is a general hyperplasia of all the elements of the decidua, which is softer than normal and contains large vascular spaces. In some cases the decidua may reach a thickness of half an inch or more, and may closely invest the entire ovum. If any of the enlarged vascular spaces rupture, hæmorrhage occurs into the substance of the decidua and in particular collects between the decidua and the membranes of the ovum. The blood then clots and layers of fibrin are deposited upon the chorionic villi. As a result of this condition, the membranes, instead of presenting a smooth surface towards the fœtus, present a surface covered with hills and hollows, resembling a mass of thrombosed veins. If a section is made through the decidua, the hills are found to be composed of masses of fibrin, outside which lies a greatly thickened decidua full of extravasated blood. To this condition the term "apoplectic ovum" has been applied.

Such an alteration in the character of the decidua

necessarily interferes with the blood supply of the embryo, and in consequence the latter dies, usually during the first two months of pregnancy. It may then be absorbed and disappear, or it may be found as a tiny almost unrecognisable mass hanging at the end of a short and often bladder-like cord. If the amount of intra-decidual hæmorrhage is sufficient to effect the detachment of the decidua and ovum from the uterus, abortion occurs. If, however, a slight vascular connection with the uterus still persists, the decidual cells may continue to multiply, the masses of fibrin become organised, the remains of the chorionic villi disappear, and the ovum becomes converted into a mass of tissue resembling the decidua. To this condition, the terms placental or fibrinous polypus or deciduoma benignum have been applied.

When the decidual endometritis gives rise to a profuse watery discharge, the term catarrhal decidual endometritis or shortly catarrhal endometritis, is applied to it. The watery discharge which it causes is known as decidual hydrorrhœa, a condition which is sometimes included under the more general term hydrorrhœa gravidarum. In decidual hydrorrhœa the decidua is inflamed, the glands particularly being involved, and a watery fluid is secreted by them which accumulates in pouches between the decidua vera and the reflexa. When the amount of fluid in a pouch has become so considerable that there is no further room for its storage, it bursts its way downwards and escapes through the uterine orifice.

Ætiology.—The cause of chronic decidual endometritis is in most cases a pre-existing endometritis,

that is to say, a fertilised ovum becomes implanted upon a diseased endometrium, which in turn forms a diseased decidua. Decidual endometritis may also result from an undue congestion of the uterus during pregnancy, even when the endometrium was previously healthy. Backward displacements of the uterus are particularly prone to give rise to such congestion, and, as is well known, they are frequently the cause of abortion. Syphilis and renal diseases are also common causes of decidual endometritis, and particularly affect the decidua serotina.

Symptoms. — Decidual endometritis may cause slight recurrent hæmorrhages, the death and expulsion of the ovum, or hydrorrhœa. In the last case the accumulation of fluid may commence at any time after the decidua vera and decidua reflexa have come into contact with one another, and the first escape of fluid may thus occur from the fourth month onwards. At first, half an ounce or so is all that escapes, but as the uterus enlarges, and as, consequently, there is room for a greater accumulation of fluid, the amount which comes away at one time may amount to fourteen ounces or even a pint. If the discharge is large in quantity and escapes frequently, the condition of the patient may be affected prejudicially by it, but usually it produces little or no constitutional effect.

Diagnosis.—Decidual endometritis can only be recognised during the continuance of pregnancy in the cases in which it gives rise to hydrorrhœa. In other cases its existence is only determined when it has caused abortion, although its presence may be suspected owing to the occurrence of repeated slight

attacks of hæmorrhage. The only point in the diagnosis which is of clinical importance is the recognition of the origin of the watery discharge. This may be due to decidual endometritis, or to one of three other conditions :—

(1) *Involuntary Escape of Urine.*—This can be distinguished from decidual hydrorrhœa by examining the patient as soon as possible after the flow has come away. If the flow has come from the uterus, the vagina will be moist. Further, if any of the escaped fluid can be obtained it will be found to be neutral or alkaline in the case of hydrorrhœa, and usually acid in the case of urine.

(2) *Rupture of the Membranes.*—This naturally only occurs once, and is followed by the onset of labour. Moreover, on palpation, the uterine walls will be found contracted down upon the fœtus.

(3) *So-called "Amniotic Hydrorrhœa."*—(*v.* page 298).

Treatment.—All that can be done during pregnancy is to remove any cause of congestion which may be present, such as uterine displacements, and possibly to promote a more healthy tone in the uterine fibre, and so to regulate the amount of blood going to the uterus, by the administration of ergot and strychnine. There is considerable difference of opinion as to the advisability and utility of administering ergot during pregnancy to a patient suffering from slight recurrent hæmorrhages. Many obstetricians are opposed to its use, on the ground that any effect it may have on hæmorrhage is due to its inducing uterine contractions, and that such contractions will increase the tendency to premature expulsion of

the ovum. Atthill,[1] on the other hand, considered that the administration of ergot and strychnine in combination exerts a valuable tonic effect upon the uterine muscle, and strongly recommends its use in cases of slight hæmorrhage in the early months. He administered five minim doses of liquor strychninæ and fifteen minim doses of liquid extract of ergot three times a day, continued for several weeks. We have adopted his suggestion in several cases, with the object of checking recurrent hæmorrhages, with the result that the hæmorrhage ceased and pregnancy continued to full term. Whether such results are to be attributed to the administration of ergot or not, there is no doubt that the drug may be safely given in the doses mentioned, and that it apparently exerts a beneficial influence. The administration of hydrastis canadensis has also been recommended on account of its action in causing contraction of the fibres of the blood-vessels without producing any effect upon the uterine muscle. The usual dose of the drug is from fifteen to twenty minims of the liquid extract.

If decidual hydrorrhœa occurs the patient must be kept in bed for a few days after each escape of fluid, on account of the risk that the sudden flow may lead to the occurrence of uterine contractions. It may be that the administration of ergot and strychnine may be of benefit in these cases by diminishing uterine congestion. Ergot, however, should in no case be given if there is any indication that contractions of the uterus are occurring. In such cases opiates may be given instead.

[1] "On the Prevention of Post-partum Hæmorrhage," 'Trans. Roy. Acad. Med. in Ireland,' vol. xv, p. 344.

ABNORMAL PERMEABILITY OF THE MEMBRANES.

In certain cases the liquor amnii finds its way in small quantities through the membranes and escapes through the uterine orifice, even though there has been no apparent rupture of the membranes; to this escape of fluid the term *amniotic hydrorrhœa* is applied. This condition is a more common cause of hydrorrhœa than is decidual endometritis; it, however, occurs later in pregnancy, and is rarely met with before the eighth month.

Ætiology.—The pathology of this condition is obscure. In some cases the fluid apparently makes its way through small tears in the membranes, which may, perhaps, be the result of some degenerative process. In others the amnion is in great part wanting, and transudation of fluid occurs through the chorion. In others the fluid finds its way through the amnion alone, and collects in a pouch between the membranes, whence it escapes owing to rupture of the chorion. In some cases, where the hydrorrhœa is apparently the result of abnormal permeability of the membranes, the latter may have really ruptured high up, while the uterine orifice is still undilated.

Symptoms.—The symptoms of this condition are identical with those of catarrhal decidual hydrorrhœa, save that, if the hydrorrhœa is due to rupture of the membranes, it may come away continuously in little gushes. If the hydrorrhœa is due to the rupture of a pouch between the membranes and the uterine wall, or between the chorion and amnion,

the fluid comes away with a rush, as in decidual hydrorrhœa.

Treatment.—There is no treatment for this condition save to try to prevent the onset of labour. The patient must be kept at rest in bed for several days, and opiates may be given with the object of checking uterine contractions.

VESICULAR MOLE.

This is the term applied to a cystic degeneration of the chorionic villi, the result of proliferation and increased activity of their epithelial coverings. It is also known as hydatidiform mole and myxoma chorii. The latter term is, however, misleading. As a result of the changes in the villi, the fœtus, as a rule, dies and is absorbed, while the cysts go on increasing in number, and finally fill the entire uterus (*v.* Fig. 119). They vary in size from that of a grape to that of a pin's head, and are described as resembling a mass of white currants floating in red currant juice. The change commences before the end of the third month. In a twin pregnancy, one ovum alone may be affected.

Frequency.—At the Rotunda Hospital, amongst 25,790 patients, the relative frequency of vesicular mole was one in 1719·33, *i. e.* 0·05 per cent.

Ætiology.—Little is known as to the direct causation of vesicular mole. It occurs particularly in multiparæ, and after chronic catarrh of the mucous membrane (Winckel); we have, however, seen a case in a primipara, and another in a 2-para. It is said to tend to recur in subsequent pregnancies. As it

starts in the chorionic villi, it can only be the result of conception.

Pathological Anatomy.—The macroscopical appearance of a vesicular mole varies somewhat according to

Fig. 119.—Uterus containing a vesicular mole, with a clot near the cervix. (*Marchand.*)

the extent to which it has involved the ovum. If the degeneration is advanced, the entire ovum is involved, and almost all its original structure is destroyed. If the degeneration is a stage less advanced, an amniotic cavity of the usual size may be found,

invested more or less completely by the degenerated chorion, and containing no trace of embryo, save perhaps a little detritus or a fragment of the umbilical cord. In these cases the fœtus has been absorbed. If the degeneration is only commencing, a portion of the chorionic villi alone is affected, and the amniotic sac contains a fœtus.

The appearance of the mole itself is very characteristic. It is composed of a mass of small cysts, which are formed along the course of numerous pedicles. The pedicle corresponds to the original chorionic villus, while the cyst is the result of the accumulation of fluid at different intervals along its course. This fluid contains salts, albumen, and mucin, and is probably due in great part to œdema of the stroma.

We have already described the three elements of which a chorionic villus consists. In the vesicle of a mole these three elements persist, but are somewhat altered. The stroma is increased in amount and degenerated, the fœtal vessels have disappeared, and scattered here and there are cells which are probably offshoots of Langhans' layer and protoplasmic masses from the syncytium. The cells of Langhans' layer proliferate, and form a continuous layer round the vesicle. They are in turn covered by the syncytium, which in places shows signs of proliferation. The mole is thus primarily due to the proliferation and increased activity of the cells of Langhans' layer and of the syncytium.

In rare cases the mole may grow through the decidua and so gain access to the uterine wall. If it penetrates the latter, we have what, to all intents

and purposes, is a malignant growth. Such a growth, after penetrating the uterine wall, may extend into the peritoneal cavity. This condition is probably closely connected with chorion-epithelioma.

Symptoms.—The subjective and most of the objective symptoms of pregnancy are present, but no fœtus can be felt nor fœtal heart heard, unless there happens to be a twin pregnancy. The uterus never corresponds in size to the period of pregnancy, it may be smaller, but is usually considerably larger. It feels more tense and more elastic than normal. There is a constant, blood-stained, watery discharge, in which small cysts may be found. Their presence is, of course, pathognomonic. Constant crampy pains also occur, due to the distension of the uterus or to its efforts to expel the mass.

Terminations.—Vesicular mole is a very serious condition. If untreated one of four terminations may follow :—

(1) Spontaneous expulsion.
(2) Death, from constant loss of blood.
(3) Death, from rupture of the uterus.
(4) Death, from peritonitis, caused by perforation of the uterus by the cysts.

Treatment.—Empty the uterus as soon as the condition is recognised. To do this, induce labour by dilating the cervix with Frommer's dilator or a hydrostatic dilator (*v.* page 528) ; the mass may then be expelled spontaneously. If expulsion does not occur, introduce the finger, or the hand, and clear out the uterus thoroughly. There will be very free hæmorrhage whilst this is being done ; but, as soon as the uterus is empty, the bleeding usually will

cease. Then douche out the uterus with hot creolin solution. If this does not finally check the hæmorrhage, plug the cavity tightly with iodoform gauze. Never curette in the first instance, as the curette may perforate the uterus with great ease. Frequently, these patients will return after a fortnight or three weeks, on account of a recurrence of hæmorrhage. The uterus should then be curetted thoroughly, as bits of the mole are in all probability left behind, and the scrapings subjected to a microscopical examination. If the malignant form of mole is diagnosed, the uterus must be removed.

CHORION EPITHELIOMA.

"Chorion epithelioma" is the term applied to a malignant tumour which starts in the epithelial layers covering the chorionic villi, spreads to and involves the uterine wall, and finally causes metastases in other parts of the body. We have discussed in full the nature, symptoms, and treatment of this condition in other works,[1] and therefore we do not consider that it is necessary again to describe it here, as its treatment belongs to gynæcology rather than to obstetrics.

HYDRAMNIOS.

This is the term applied to an excessive quantity of liquor amnii. The normal amount varies considerably, but as a rule anything up to two pints

[1] 'A Short Practice of Gynæcology,' 3rd edition, 1908; 'A Manual of Midwifery,' 1905.

(1136 grm.) may be considered to be normal, and anything over that amount to be excessive. In hydramnios the amount may even exceed twenty pints (11359 grm.).

Frequency.—At the Rotunda Hospital amongst 25,790 patients the relative frequency of hydramnios was 1 in 196·87, *i. e.* 0·55 per cent.

Varieties.—Two forms are described:—(1) Acute, coming on in a single night; it is very rare. (2) Chronic, when the fluid accumulates gradually.

Ætiology.—The pathology of hydramnios is very uncertain. It is found in association with syphilis of the child, anencephalus, spina bifida, multiple pregnancy, and abnormalities of the umbilical cord and placenta, and with renal and cardiac disease, anæmia, and hydræmia of the mother. Ballantyne considers that hydramnios may be due to a chemical irritant which comes from the mother or the fœtus, and which excites a flow of lymph or serum; to increased pressure in the umbilical vein and its branches arising from various fœtal diseases and deformities; to changes in the maternal blood which allow increased transudation; or that it may possibly be formed by fœtal urine or cerebro-spinal fluid.

Terminations.—Four terminations may occur:—

(1) Premature labour may set in, as a result of over-distension of the uterus.

(2) In less degrees of distension, the patient may go to full term.

(3) The uterus may rupture from over-distension.

(4) The patient may die of failure of the heart, due to the pressure of the enormous uterus.

Symptoms.—The symptoms during pregnancy are

those of pressure on the abdominal and thoracic viscera, due to the over-distension of the uterus. Thus we find:—constipation, from pressure on the rectum; frequent micturition, from pressure on the bladder; pendulous abdomen, from pressure on the abdominal walls; vomiting, from pressure on the stomach; dyspnœa and cardiac palpitation, from pressure respectively on the lungs and heart.

During labour many complications may occur. The first stage is tedious, due to the over-distension of the uterus, and consequent weakening of the muscle-fibres. Malpresentations of the child are common. At the time of the rupture of the membranes, owing to the great rush of water, the child may be swept into a malpresentation, if it is not already lying in one, and the cord may become prolapsed. As a result of the sudden diminution in size of the uterus, the placenta may be detached, and hæmorrhage result. The second stage may be precipitate, provided the presentation of the child is correct. The third stage, again, is tedious, owing to atony of the uterus, the placenta may be retained, and post-partum hæmorrhage result.

Diagnosis.—The uterus is considerably larger than it ought to be, in proportion to the period of pregnancy. The fœtus is felt with difficulty and it may be impossible to hear the fœtal heart, owing to the quantity of fluid which lies between the child and the uterine wall during labour. Little can be felt by vaginal examination, save the bulging membranes, until the latter have ruptured and the presenting part has descended.

Treatment.—During pregnancy, support the uterus

by an abdominal binder. Occasionally, it may be necessary to induce premature labour, owing to cardiac symptoms. When the patient comes into labour, do not allow the membranes to rupture spontaneously, as most of the troubles that occur are due to the sudden rushing away of the waters. As soon as the os is as far dilated as is considered safe, introduce as much of the hand as necessary into the vagina; pass a couple of fingers between the membranes and the uterine wall; then slip a knitting-needle or the stilette of a catheter along them, and puncture the membranes as high up as possible. Keep the hand in the vagina, with the fingers plugging the os so that the liquor amnii may drain away slowly. Lastly, palpate the fœtus, to ascertain if it is lying in a correct position.

OLIGOHYDRAMNIOS.

In this condition the liquor amnii is deficient in quantity, and as a result, the amniotic sac may become partially collapsed and adherent to any part of the fœtus. As the latter grows, these adhesions are drawn out into bands, and these bands occasionally encircle the fœtal limbs, thus causing intra-uterine amputation and similar accidents.

ANOMALIES OF THE PLACENTA AND FUNIS.

Anomalies of the placenta in size, shape, or position, and of the cord in length and manner of insertion, are frequently met with. The most important of these are :—

(1) *Placenta Membranacea.*—The placenta is large and greatly thinned out, so that it covers almost the entire internal uterine surface. Retained adherent placenta may be caused thus, as the thin placenta crumples up when the uterus contracts, instead of becoming detached.

(2) *Placenta Succenturiata.*—The placenta, instead of being composed of a single mass, has one or more detached portions, only connected with the

FIG. 120.—Placental anomalies:—I. A placentâ succenturiata II. A battledore placenta. III. A velamentous insertion of the cord.

placenta proper by means of blood-vessels. These secondary placentæ are very likely to remain behind after delivery, and to cause post-partum hæmorrhage, or sapræmia. If they cause hæmorrhage immediately after delivery, they will be discovered if the uterus is explored, but sometimes they do not begin to cause symptoms until a day or two later, and then secondary post-partum hæmorrhage sets in (r. page 471).

(3) *Battledore Placenta.*—The cord is inserted

into the edge of the placenta, instead of into the centre. It is of no clinical importance (*v.* Fig. 120).

(4) *Placenta Prævia.*—The normal situation of the placenta is on the anterior or posterior uterine wall, with its lower border two to four inches (5–10 cms.) above the internal os. If any part of it lies "so near the internal os, that it is torn off in the formation of the lower uterine segment," the condition is known as placenta prævia (Winckel). It will be discussed later (*v.* page 380).

(5) *Insertio Velamentosa.*—In this condition, the placental vessels which form the cord do not unite upon the surface of the placenta, but run separately for some distance along the membranes. They are thus liable to be torn when the membranes rupture, and so to cause the death of the child (*v.* Fig. 120).

CHAPTER XVII.

ERRORS OF POSITION, OR OF DEVELOPMENT, OF THE PREGNANT UTERUS.

Displacements of the Pregnant Uterus—Pathological Anteflexion—Pathological Anteversion—Retro-deviation—Incarceration of a Retro-deviated Uterus—Prolapse of the Uterus—Malformations of the Uterus.

DISPLACEMENT OF THE UTERUS.

Pathological Anteflexion.—This condition occurs when the fundus is fixed in a position of anteflexion. It may be :—

(1) Congenital.
(2) The result of inflammation.
(3) The result of vaginal fixation of the uterus for the cure of chronic retroversion.

If due to either of the first two causes, it usually gives little trouble, and frequent micturition may be the only symptom. If due to the last cause the condition is more serious. Usually, as the uterus increases in size it breaks free from its vaginal attachment, and then no harm results. If this does not occur, as the uterus grows the cervix is gradually drawn upwards ; the portion of the fundus which is attached to the vagina remains in front of, and

below, the level of the cervix, so forming a kind of cul-de-sac, while the posterior uterine wall develops sufficiently to accommodate the child. When labour comes on, the child's head is driven down into this cul-de-sac, instead of against the internal os. The cervix consequently does not dilate, and the uterus may rupture.

Treatment.—It will usually be necessary to dilate the os artificially and apply forceps. A dilator of the type of Bossi's or Frommer's cannot be used in these cases on account of the impossibility of introducing it into the cervix. Consequently, it will be necessary to use Barnes' or Champetier de Ribes' hydrostatic dilators, or to incise the cervix. If this cannot be done, it may be necessary to perform Cæsarean section.

Pathological Anteversion.—This condition is of very common occurrence in the early months of pregnancy, and causes increased pressure on the bladder. It also occurs in the later months of pregnancy in cases of contracted pelvis, and occasionally in pluriparous women. The uterus is pushed upwards by the narrow pelvic brim, and falls forward against the abdominal wall, a pendulous abdomen resulting. The condition tends to cause malpresentations.

Treatment.—During pregnancy, the patient should wear a properly fitted abdominal belt. During labour, the belt should be replaced by a binder, and the patient should lie on her back until the head fixes.

Retro-deviation.—Pregnancy frequently occurs in

a retro-deviated uterus, and then may terminate in four ways :—

(A) **Abortion.**—This happens very frequently. A retro-deviated uterus is subject to endometritis, a condition which favours the occurrence of abortion.

(B) **Restitution.**—As the uterus increases in size, it gradually rights itself, and then pregnancy continues as usual.

(C) **Anterior Development.**—This is a very rare occurrence, but is sometimes met with as the result of an adherent retro-deviation. It is the reverse of the condition which may result after vaginal fixation of the uterus. The fundus remains bound down in Douglas' pouch, but the anterior uterine wall develops sufficiently to permit the growth of the fœtus. Consequently, at full term, there is a cul-de-sac behind the cervix, into which the child's head is driven. The treatment in this condition is practically the same as in the case of an anterior cul-de-sac.

(D) **Incarceration.**—This is a serious condition, and, if not relieved (*i. e.* if the uterus is not replaced or emptied), will almost certainly result in the death of the woman. It is the result of the impaction of the retro-deviated uterus in the pelvis, and its occurrence is favoured by the presence of a contracted pelvis, as the overhanging promontory prevents the uterus from rising (*v.* Fig. 121).

Symptoms.—A tumour which is increasing in size fills the pelvis ; the consequent symptoms are all the result of its presence. They are :—pain, constipation, and difficulty in micturition, all of which increase from day to day. One day the patient becomes unable to pass water, her bladder becomes over-

distended, and then the urine dribbles away involuntarily (*ischuria paradoxa*). It is usually while in this condition that she sends for medical aid. On examination of the abdomen, a tumour is felt extending up to the umbilicus, which yields a dull note on percussion. This may put us off our guard, as we may think that the tumour is the uterus, while

Fig. 121.—Incarceration of a retro-deviated uterus, drawn from nature. Specimen in St. Thomas's Hospital. (*Barnes.*)

in reality it is the over-distended bladder. On making a vaginal examination, a tumour is felt filling Douglas' pouch and pressing forwards towards the pubes. The cervix is drawn upwards and pressed forwards, so that it lies above the symphysis, and sometimes it may be impossible to feel it. The urethra is also so drawn up that it may be difficult to find its orifice in order to pass a catheter.

Treatment.—The condition having been recognised, the first step is to empty the bladder, and this is sometimes a matter of great difficulty. We have already referred to the different methods recommended (*v.* page 286). As soon as the bladder has been emptied, the next step consists in replacing the uterus, under chloroform if necessary. If this can be done, a pessary is inserted, and the condition is cured. In order to replace the uterus the patient is placed in the dorsal position, two fingers are intro-

Fig. 122.—The knee-chest position.

duced into the vagina, and an attempt is made to push the fundus upwards out of Douglas' pouch. If this cannot be done, one or both fingers are introduced into the rectum, and an attempt made to push up the fundus from there. If even this fails, the patient must be placed in the knee-chest position, and a further attempt made to push up the fundus from the rectum. In some cases, even after manual efforts had failed, the use of a colpeurynter (a pear-shaped, rubber, hydrostatic, vaginal dilator) has succeeded, and so is worthy of a trial.

If repeated attempts at reposition fail, abortion

must be brought on. Owing to the position of the cervix, it may be impossible to pass any instrument into the uterus. If all attempts fail, the uterus must be tapped with a fine trocar through the posterior vaginal wall, and a portion of the liquor amnii drawn off. This is a certain method of procuring abortion, and is sufficiently safe if all due aseptic precautions are taken. If the condition is left unrelieved, death will be the probable result. The uterine wall may slough from the continued pressure; the bladder may rupture from over-distension; a very virulent form of cystitis may result from retention and decomposition of urine; and consecutive nephritis may result from the cystitis. Any of these conditions, in turn, may give rise to septic peritonitis.

Prolapse of the Pregnant Uterus.—Pregnancy, occurring in a uterus which is entirely prolapsed outside the vulva, has been recorded. It is exceedingly rare. The usual condition met with is one in which the cervix protrudes out of the vagina. This may be due to a hypertrophic elongation of the cervix, accompanied by descent of the uterus, or existing alone. The result of such a condition may be serious. The exposed cervix becomes hypertrophied, its tissue dense and unyielding, and numerous ulcers form upon it. When the patient comes into labour, the cervix may not dilate, and rupture of the uterus may then result, or, even if labour proceeds normally, subsequent infection of the uterus may occur.

Treatment.—Replace the prolapsed uterus, and insert a ring pessary. If the mucous membrane of

the cervix is dense and ulcerated, warm douches, glycerine plugs, and hot baths will help to soften it. If there is no inversion of the vagina, and the cervix alone is prolapsed, Winckel recommends amputation of it in the early months of pregnancy. If the case is seen too late for this treatment, the patient must be carefully watched when she comes into labour. If the cervix does not dilate, it may have to be incised, or even Cæsarean section performed.

MALFORMATIONS OF THE UTERUS AND VAGINA.

To understand these conditions, it is necessary to refer for a moment to the development of the genital organs. Two tubes—the ducts of Müller—run down at each side of the spine in the early embryo. They unite in their lower half, and the septum which at first separates them disappears. From the upper ununited portions of the ducts are derived the Fallopian tubes; from the lower portions, which coalesce, are derived the uterus and vagina. We see, then, that the Fallopian tube, with its corresponding portion of the uterus and vagina, was once a single duct. If this point is clearly grasped, it is easy to understand the different malformations that may arise:—

(1) The tubes may unite in their lower half, but may not coalesce, and thus an *uterus duplex* or *didelphys* be formed (*v.* Fig. 123).

(2) The tubes may not unite until the level of the cervix is reached, and thus an *uterus bicornis* may be formed (*v.* Fig. 134).

(3) The tubes may unite, and the septum may

persist (*a*) in the uterus—*uterus septus bilocularis* (*v.* Fig. 125) ; (*b*) in the vagina—*vagina septa.*

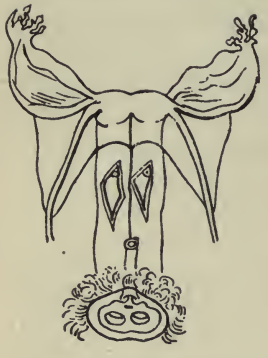


Fig. 123.—Double uterus and vagina. (*Courty.*)

Fig. 124.—Uterus bicornis. (*Schroeder.*)

(4) One Müllerian duct may develop whilst the other remains rudimentary—*uterus unicornis* (*v.* Fig. 127).

Fig. 125.—Uterus septus bilocularis. (*Cruveilhier.*)

Fig. 126.—Uterus cordiformis. (*Kussmane.*)

(5) A depression may remain at the top of the fundus, corresponding to the point where the ducts united—*uterus cordiformis* (*v.* Fig. 126).

In order that pregnancy may occur in any of these abnormalities, it is necessary that, at least, one side of the genital tube is fully developed.

If pregnancy occurs in a double uterus, certain complications may arise :—

(1) Abortion. This is unusual.

(2) Tedious labour, due to the accompanying imperfect development of the uterine muscle, or to

Fig. 127.—Uterus unicornis. (*Courty.*)

the obstruction offered by the other half of the uterus.

(3) Post-partum hæmorrhage, and retained placenta. This is prone to occur if the placenta is attached to the septum.

If pregnancy occurs in the rudimentary horn of an uterus unicornis, the condition resembles extra-uterine pregnancy. The treatment is similar.

CHAPTER XVIII.

ECLAMPSIA.

Definition — Frequency — Morbid Anatomy — Ætiology: Predisposing Conditions—Symptoms: Prodromal, Actual—Diagnosis —Complications—Treatment: Prophylactic, Curative, Chloroform Treatment, Morphia Treatment, Position of Patient, Feeding, Infusion of Saline Solution, Induction of Labour, Venesection, Prognosis.

Eclampsia is the term applied to epileptiform attacks which sometimes occur in pregnant or puerperal women, and which are the manifestations of cerebral intoxication or over-activity arising as an indirect result of the pregnancy.

Frequency.—It is difficult to estimate with accuracy the relative frequency of eclampsia, as hospital statistics—which we have to follow—will show an unduly high rate. The statistics of a large number of cases drawn from various British and Continental hospitals give a rate of 1 in 357·48. In the Rotunda Hospital, amongst 25,790 patients the relative frequency of eclampsia was 1 in 347·86, *i. e.* 0·28 per cent.

Morbid Anatomy.—If a post-mortem examination is made on a woman who has died of eclampsia, a series of more or less constant morbid conditions is

met with. Nothing, however, has been found which can be definitely regarded in the light of a primary lesion. The most important conditions which are met with are as follows :—

The liver is more yellow in colour than usual, due to commencing fatty degeneration. Small hæmorrhages are met with both beneath the capsule and in the liver substance, and also irregular and reddish areas of necrosis, especially round the smaller portal spaces, probably due to thrombosis of these vessels, and from which emboli of fat or of liver cells may be carried to other organs. These changes are so constant in eclampsia that some French writers consider that they constitute the primary lesion, and that they are even of more importance than the renal lesions.

The kidneys are diseased in from 90 to 95 per cent. of cases. The commonest condition found is that known as the pregnancy kidney (*v.* page 281). Chronic nephritis is more rarely present. Minute areas of necrosis resembling those met with in the liver are found distributed around some of the convoluted tubes. In a very small proportion of cases, the renal changes can be attributed to the effects of obstructive suppression of urine, due to pressure upon the ureters.

The spleen is enlarged, congested, and soft. Areas of necrosis, as in the liver, are met with, and small hæmorrhages beneath the capsule and in the spleen substance. The pancreas also presents areas of necrosis, and may be very anæmic. The brain is sometimes hyperæmic, and sometimes anæmic, somewhat œdematous with consequent flattening of the

convolutions, and shows minute hæmorrhages in various parts. Small areas of necrosis due to thrombosis of the smaller cerebral vessels have also been found.

The lungs are usually œdematous, especially at their bases; subpleural ecchymoses are seen, and emboli are found, which may come from the necrotic areas in the liver or from the placenta.

Changes have been also met with in the liver and kidneys of the fœtus resembling those which occur in the mother. The placenta is frequently the seat of white infarction, and it is thought that, from these areas, emboli consisting of syncytium may pass into the maternal blood and cause coagulation, as well as acting as emboli.

Ætiology.—We have very little positive knowledge of the causation of eclampsia, and consequently there are many hypotheses.

Frerichs believed eclampsia to be uræmic in origin, *i. e.* due to the retention of urea in the blood. Stumpf considered it to be due to the circulation, in the blood, of some poison—probably acetone—produced by an abnormal decomposition in either mother or child. He also considered that this poison in its passage through the kidneys caused nephritis, through the liver a destruction of the parenchyma of that organ, and through the brain convulsions and coma. The fact that the fœtus usually dies in these cases, the increased frequency of eclampsia in multiple pregnancy, and the improvement in the maternal prognosis consequent on the death of the fœtus, are all suggestive of a fœtal origin of the eclamptic poison. Schmorl attributed

eclampsia to an intoxication by coagulation-producing ferments which originate in the placenta.

Another hypothesis attributed eclampsia to the retention of the normal urinary toxins owing to a failure of function on the part of the kidney, *i. e.* a "urinæmia." Coincidently with the onset of the premonitory symptoms of eclampsia, the urine has been noticed to contain a diminished quantity of these substances; the total amount of urine passed is also considerably diminished. Coincidently with the recovery of the patient, the quantity of toxic substances in the urine is considerably increased, as is the total amount of urine passed. All the constituents of the urine contribute to this poisoning, notably creatin, creatinin, and carbamic acid. The failure of function of the kidneys is due, perhaps to pre-existing renal disease—pregnancy kidney, or chronic nephritis, perhaps to the effect of a fœtal toxin (Fehling), or maternal toxin (Stumpf), circulating in the maternal blood. The facts that eclampsia most frequently occurs in patients who are the subjects of renal disease, and that it rarely, if ever, occurs when this condition has been so treated that urinary suppression does not occur, strongly support this theory. Supposing such a theory to be correct, the necrotic areas which are met with in the various viscera can be explained by considering them to be due to some coagulation effect of the toxins on the maternal blood, or to the rupture of small vessels during the eclamptic attacks. The small proportion of cases in which there is no renal disease can be explained by the neurotic theory.

The so-called "auto-intoxication theory" originated

by Bouchard, attributed eclampsia to an auto-intoxication due to failure of function not only of the kidneys but of the liver. It thus differs from the foregoing theory only in the inclusion of the liver as an element both in the production and the non-elimination of toxins, which may thus consist of urinary extractives, of biliary substances remaining in the blood, and of ptomaines which are no longer destroyed in the liver.

A final theory—the neurotic theory—was brought forward to account for those cases in which there was apparently no failure of function on the part of the kidney, liver, or other eliminatory organ. It attributes eclampsia to heightened irritability of the nerve centres, or to their over-activity caused by excessively strong stimuli from the uterus (*eclampsia reflectorica*).

Apart from hypotheses, there are certain conditions which are known to predispose to eclampsia. These are :—

(1) Acute and chronic diseases of the kidneys, particularly "pregnancy kidney" (*v.* page 281).
(2) Prolonged labour.
(3) Elderly and very young primiparæ—*i. e.* rigid uterine muscle-fibres, and so more painful labour pains.
(4) Long retention of the excretions.
(5) Multiple pregnancy.

Taking into consideration the great number of different theories that are brought forward to explain the ætiology of eclampsia, the majority of which are apparently supported by facts, we are forced to the conclusion that we should look, not for one specific

cause, but for several causes, which, acting either singly or together, will be sufficient to determine the onset of fits. These causes may be classified as follows :—

I. The poisoning of the nerve centres by toxins circulating in the blood owing to :—

(1) The accumulation of normal toxins from failure of the renal or hepatic function, owing to renal or hepatic disease.

(2) The excessive formation of normal toxins, or the formation of abnormal toxins, either in the mother or fœtus, which toxins during their process of excretion through the kidneys cause nephritis, and hence suppression of urine, and hence a further increased amount of toxins in the blood.

II. The over-activity of the nerve centres due to :—

(1) Their over-excitability to normal stimuli, as in the case of hysterical patients or epileptics.

(2) Their over-irritation by excessive stimuli, as in the case of obstructed labour, very painful labour pains, elderly and very young primiparæ.

Symptoms.—The symptoms must be considered under two heads :—

(A) Prodromal symptoms.

(B) Actual symptoms.

(A) **The Prodromal Symptoms.**—These come on, in the large majority of cases, a short time before the onset of the fits, and are of great importance, as their timely recognition and treatment may stave

off the threatened attack. The first prodromal symptom of eclampsia may be said to show itself the moment a pregnant woman passes urine containing albumen, if previously her urine was normal. In this connection the following rule must be remembered :—it is *advisable* to examine the urine of a pregnant woman during the sixth or seventh month, and to ascertain the amount passed in twenty-four hours. It is *necessary* to do so, if in consequence of her history or appearance there are grounds for supposing that she is suffering from any form of renal disease. The more immediate prodromal symptoms are :—complete or partial, temporary or persistent, loss of vision; flashes of light before the eyes; vertigo; headache; drowsiness; mental depression; nausea; and epigastric pain. At the same time the amount of urine excreted becomes very considerably diminished; and, if a specimen can be obtained for examination, it is found to contain a very large quantity of albumen, and numerous granular and fatty tube-casts.

(B) **The Actual Symptoms.**—These commence with the onset of the fits. Eclampsia is rarely, if ever, met with before the sixth month, and usually occurs between the eighth month and full term, The fits may commence before the onset of, during, or after labour. The most common time is before or during labour, the rarest during the puerperium. A fit lasts from one to one and a half minutes, and consists of three stages—a preliminary stage, a tonic stage, and a clonic stage,—followed by a varying period of coma. In the preliminary stage, the eyelids twitch vigorously and spasms of the

muscles of respiration occur. Then the tonic stage supervenes, and the patient lies with all her muscles contracted. She becomes deeply cyanosed, and froth appears at the mouth. The clonic stage follows; she "works" vigorously for a time, then respiration gradually returns, and the patient lies in a condition of deep coma. The duration of coma, as a rule, varies according to the number of fits that have occurred. At first, it may only last a few minutes; but, as the number of fits increases, she lies in a continuous condition of coma during the intervals between them. The number of fits varies from one or two up to any number. They may pass off entirely for a time, and then recur. In a severe case the fits follow one another at ever-shortening intervals; the heart becomes weaker, and the lungs œdematous, at first at the bases, and then universally. The pulse it frequent; the temperature, which was normal at first, rises as the case progresses, perhaps attaining a height of 104° F. (40° C.); total or partial loss of vision or of memory ensues, and, if the patient recovers, may persist for a considerable period after the fits have ceased.

Diagnosis.—As eclamptic fits are frequently most atypical in their form, there may at times be great difficulty in arriving at an immediate diagnosis. Too much reliance must not therefore be placed on the form of the convulsion. More important information will be obtained by studying the prodromata, the history of the case, and the attendant symptoms. Eclampsia must be distinguished from epilepsy, hysteria, drunken delirium and coma, and the coma and convulsions of meningeal and cerebral disease. As a

general rule, every form of convulsion in a pregnant woman, who is suffering from renal disease, should be regarded as eclampsia until the contrary is proved to be the case. Epilepsy may be recognised by the history of former attacks, by the absence of the usual eclamptic prodromata, by the initial epileptic aura, by the sharper onset of the convulsive seizure, and by the usually complete absence of all renal symptoms. Hysteria is recognised by the irregularity of the convulsion, by the absence of respiratory spasm, of all actions which would hurt the patient, and of loss of consciousness, and by the passage of large quantities of pale urine. Alcoholic coma and delirium may be suspected by the history of the case, and the alcoholic odour of the breath. It can be definitely recognised as it passes off, and does not recur. Renal symptoms are also probably absent. The coma and convulsions of meningeal and cerebral disease may be most difficult to distinguish from eclampsia, if the history of the case cannot be obtained. The two conditions may co-exist, as cerebral hæmorrhage is an occasional occurrence in eclampsia.

Complications.—The principal complications to be feared are failure of the heart, and œdema of the lungs. They occur in almost all fatal cases, and are the direct cause of death. Hæmorrhage into the brain may occur during a fit, or may take place even after the fits have entirely ceased. We have seen a case in which the patient died of cerebral hæmorrhage, which apparently took place thirty-six hours after the last fit.

Treatment.—The treatment of eclampsia must be considered under two heads :—

(A) Prophylactic treatment.
(B) Curative treatment.

(A) **Prophylactic Treatment.**—This should be adopted in the case of every patient who has persistent albuminuria, especially if there are tube-casts in the urine. Tarnier stated that when a patient suffering from albuminuria has been on milk diet for a week, she almost to a certainty escapes eclampsia, and another French writer (Ribemont-Dessaignes) says that eclampsia occurs almost exclusively in women whose urine has not been examined during pregnancy. Other writers, notably Whitridge Williams, do not accept this statement as more than approximately correct. From the point of view of treatment, however, it may be accepted, and accordingly the patient should be placed on a milk diet, and limited as far as possible to it so long as the amount of urine is insufficient. It is rarely necessary to enforce a milk diet during the entire pregnancy. Milk and other fluids must form a great part of the diet, but fish, white meat, eggs, and vegetables also may be sometimes allowed.

Even more necessary than a rigid milk diet is the due regulation of the bowels. The latter should be kept free by the daily administration of a purgative such as Sulphate of Magnesia, Cascara Sagrada, Aloin, or of stronger purgatives, such as the Pil. Colocynth. et Hyoscyami (B. P.). The amount of urine the patient passes must be most carefully watched, in order that any marked diminution may be immediately detected. The dietary of the patient and the daily amount of urine passed should be in direct proportion to one another. The freer the

action of the kidneys, the more liberal the dietary. If any marked diminution in the urine occurs, a hydragogue purgative must be at once administered, followed, if the diminution in the urine is considerable, by a wet pack and hot baths. The patient is also wrapped in blankets in order to favour sweating. A suitable purgative to administer in these cases consists of Calomel 10 grains, combined with Pulv. Jalapæ Co. 1 drachm, and followed in six hours by an enema if necessary. If, in spite of all precautions, an eclamptic fit occurs, our treatment must then become curative.

(B) **The Curative Treatment.**—This must be chiefly directed towards two points:—

(1) The arrest of the fits.

(2) The staving off of complications.

(1) The fits must be checked at the earliest possible moment, as each successive fit leaves the patient more comatose, and more likely to fall a victim to the complications of a failing heart and œdema of the lungs.

There are three ways of checking or endeavouring to check the fits:—

(*a*) By administering sedatives.

(*b*) By removing toxic substances from the blood and tissues.

(*c*) By emptying the uterus.

(*a*) *By administering sedatives.*—There are two distinct methods of treatment which fall under this heading—the chloroform and chloral treatment, and the morphia treatment.

The chloral and chloroform treatment consists in administering, upon the onset of the attack, thirty

grains of chloral hydrate by the rectum; and repeating it every two hours until the fits cease, but not more than three and a half drachms should be given in the twenty-four hours. The inhalation of chloroform is commenced as soon as any sign of the onset of a fit occurs, and continued until the fit ceases.

The morphia treatment consists in the administration of large doses of morphia, hypodermically, as recommended by G. Veit. It is considerably the better method of treatment, and is carried out as follows:—Half a grain of morphia is administered hypodermically upon the onset of the first fit, and is followed every two hours by a quarter of a grain, until the fits cease. Not more than three grains should be given in the twenty-four hours.

Either of these methods of treatment will check the fits; but both choral and chloroform are said to depress the heart seriously, and consequently to favour heart failure. On this account the morphia treatment is to be preferred. On the other hand, Stroganoff, of St. Petersburg, recommends the use of chloral hydrate associated with morphia, and he records a series of 113 cases treated in this manner with only six deaths. He also administers morphia during the attacks.

(*b*) *By removing toxic substances from the blood and tissues.*—The immediate removal, so far as possible, of toxic substances from the organism of the patient is of the greatest importance, inasmuch as even if they are not the actual cause of the eclampsia, they are a most serious accompaniment. Their removal is, in the main, effected by increasing the

eliminatory functions of the body. With this object, purgatives are freely used. If the patient is conscious, calomel and compound jalap powder, as recommended above, are the best purgatives; if, however, she is comatose, it is useless to place any bulky medicine in her mouth, as it would not be swallowed. Two minims of croton oil, made into a small bolus with a little butter, and placed as far back upon the tongue as possible, may reach the stomach. A copious soap and water enema should also be given to wash out the rectum and lower bowel. Further, every effort should be made to encourage free sweating. The patient must be kept in blankets, and hot baths administered if possible; if the latter are not possible, a wet pack or hot-air baths may be tried instead. The amount of urine excreted must also be increased as much as possible, by such means as hot stupes over the kidneys, and abundance of fluid by the mouth if the patient is conscious. Diuresis, or, at any rate, the dilution of the toxin, can be obtained by intra-venous or subcutaneous injection of saline solution (Jardine). For this purpose, normal saline solution, made with common salt (0·6 per cent.), is used, or a mixture of three parts of salt and one part of bicarbonate of potash is used instead of plain salt. The latter mixture is said to have the greater diuretic effect (Jardine). From two to three pints (1136-1704 c.cs.) are injected, and repeated as often as is thought necessary. In association with saline infusion, venesection has been recommended, with the object of removing some of the toxin-laden blood and replacing it by

saline solution. Up to seventeen ounces (490 c.cs.) of blood have been withdrawn at a time. Whatever may be its value from the point of view of removing toxins, it certainly is of use in plethoric patients where there is marked engorgemement of the right heart and pulmonary circulation (Fehling). On the other hand, Stroganoff, to whose treatment we have referred above, condemns hot baths or packs and never performs venesection, so that the correct treatment of eclampsia seems to be almost as undecided as its ætiology.

(*c*) *By emptying the uterus.*—Emptying the uterus is said by Dührssen to be a certain means of checking the fits. We should prefer to modify this statement by saying, that, if the patient survives the emptying of the uterus, whether by artificial or natural means, she will most probably recover. That is to say, the prognosis of the case becomes most favourable when the patient is safely delivered. On the other hand, it is necessary to remember, first, that neither all the factors nor any of the effects of eclampsia pass away the moment the child is born; and, secondly, that uterine contractions, like any other violent movement or emotion, directly excite the convulsive attacks. If the fits can be checked before labour comes on, the prognosis of the case will be improved. If labour comes on before the fits are checked, the shorter the duration of labour the better the prognosis of the case. If the fits continue in spite of all treatment, and labour does not come on of its own accord, the uterus had better be emptied. In such a case the prognosis cannot be made worse, while it may be improved.

It thus seems best not to induce labour unless all other means of checking the fits have failed, and, if labour comes on spontaneously, to shorten its duration as much as possible, without employing such violence as would cancel the good obtained from the shortening of labour. In other words,—apply the forceps, and deliver the child, as soon as the necessary conditions for its application are present, but do not adopt such violent measures as Cæsarean section or *accouchement forcé*. Any necessary operation must be performed while the patient is deeply under an anæsthetic, so as to lessen the shock of the operation.

If it is decided to empty the uterus before the onset of labour, the os can be dilated by deep incisions (Dührssen), by Champetier de Ribes' hydrostatic dilators, or by combined digital and instrumental dilatation. Stroganoff prefers Champetier de Ribes' dilator, on which, after its introduction, he applies traction. The special form of uterine dilator designed by Bossi, or, better, the modification of it designed by Frommer, is undoubtedly a most useful instrument for effecting dilatation of the cervix in these cases (*v.* page 328). Leopold effected delivery, after preliminary dilatation of the cervix by Bossi's dilator, in twelve cases of eclampsia without a maternal death. In most of his cases the convulsions ceased or became less severe immediately after delivery, and in none of them was there any laceration of the cervix. Seven children were extracted alive with the forceps; the remainder were born dead. When the fœtus was found to be dead before delivery, its extraction was facilitated by

craniotomy. These results are such as to justify the hope that delivery in this way will materially lessen the mortality in eclampsia. All efforts at delivery should be carried out under full anæsthesia.

(2) Complications will be best avoided by intelligent nursing, and by paying the greatest attention to details. Whilst the patient is in a fit, she must be prevented from injuring herself. She is especially liable to bite her tongue, when it is extruded during the fit. This is prevented by the use of a gag. A very serviceable one may be made in a moment by wrapping a towel or other piece of cloth round a spoon. All feeding by the mouth must be stopped, as, if the patient is comatose, nourishment placed in the mouth is more likely to find its way into the lungs than into the stomach. If it is required to give nourishment while she is in this condition, nutrient enemata must be administered. The position of the patient must be such that the saliva, which collects in the mouth, will trickle out, instead of running down into the trachea, *i. e.* she must lie upon her side, and not upon her back. If the heart is weak and rapid, digitalin and strychnine may be administered hypodermically.

We may sum up in a few words the treatment of eclampsia, as we advise it to be carried out. On the first onset of a fit, turn the patient on her side and place a gag between her teeth. As soon as possible give half a grain of morphia hypodermically. If the patient is conscious after the fit is over, give her a strong cathartic. If she remains unconscious, give her croton oil, as has been described, and administer an enema. Encourage the action of the

skin and kidneys. If the latter do not act, inject saline solution into the cellular tissue. Repeat the morphia as described, and in accordance with the number of the fits. If the patient's condition is improving, and if she is not in labour, do nothing calculated to bring on labour. If it comes on of itself hasten the second stage. If the patient's condition is becoming worse in spite of the adoption of the foregoing treatment, empty the uterus after dilating the cervix with Champetier de Ribes' bag or Frommer's dilator. Watch the heart carefully and administer stimulants if required, and oxygen inhalations if the patient becomes cyanosed.

Prognosis.—The prognosis for the infant in eclampsia is very grave. For the mother, the prognosis varies according to the time at which the fits commence. It is worse when the onset of the fits occurs during pregnancy or labour; it is better when they start during the puerperium. The greater the number of fits, the worse is the prognosis. A patient has recovered after eighteen fits (Winckel), and another after the enormous number of eighty-one (Rosenstein), but such cases are very rare; as a rule, ten fits constitute a very serious case (Dührssen). If the child dies, the maternal prognosis is improved. The amount of urine and the quantity of albumen in it, her temperature, and the condition of her heart and lungs all furnish important indications of the patient's condition.

CHAPTER XIX.

ABORTION — MISCARRIAGE — PREMATURE LABOUR — DELAYED LABOUR.

Abortion: Threatened Abortion, Cervical Abortion, Missed Abortion, Complete Abortion, Incomplete Abortion—Miscarriage—Premature Labour—Delayed Labour.

ABORTION.

Abortion is the term applied to the expulsion of the ovum from the uterus before the complete formation of the placenta, *i. e.* before the commencement of the fourth month.

Frequency.—At the Rotunda Hospital amongst 25,790 patients the relative frequency of abortion was 1 in 29·57, *i. e.* 3·38 per cent. This number is, however, probably too small, as women usually do not go into a hospital in such cases.

Ætiology.—The causes of abortion may be divided into two groups :—

(A) Causes which affect the attachment of the ovum to the uterus.

(B) Causes which bring about the death of the embryo.

(A) **Causes which affect the Attachment of the Ovum to the Uterus.**—Four different causes are included in

this group:—(1) Diseases of the decidua or fœtal membranes. (2) Interference with the development of the uterus. (3) Direct contraction-producing agents, or so-called Oxytocics. (4) Injuries.

(1) Diseases of the decidua or fœtal membranes are, perhaps, the commonest causes of abortion. In some cases they may bring about the death of the embryo, and, consequently, fall into the second group mentioned above; but, in the greater number of cases, they cause abortion by interfering with the normal relations of the decidua and the ovum. The most common pathological conditions met with are decidual endometritis, syphilis of the ovum, and commencing vesicular degeneration of the chorion. Malignant disease of the endometrium may, perhaps, be added to this group. It is, however, a most uncommon cause, as its presence usually ensures sterility.

(2) Interference with the development of the uterus is a common cause of abortion. Such interference may be caused by mal-positions of the uterus; mal-development and tumours of the uterus; abdominal and pelvic tumours which press upon the uterus; and pelvic adhesions.

(3) Direct contraction-producing agents or oxytocics, are to be found in certain drugs—as savin, ergot, carbonic acid gas, in excessive physical exercise or mental excitement, and in excessive sexual intercourse. All these are extremely rare causes of abortion. The drugs only cause abortion when given in poisonous doses. An accumulation of carbonic acid gas in the maternal blood sufficient to produce contractions probably only occurs under

conditions which produce partial or complete asphyxia of the mother. Excessive physical exercise or mental excitement only causes abortion when occurring in association with a diseased condition of the endometrium or ovum, and then it may be the determining cause. Excessive sexual intercourse probably only produces abortion under similar circumstances.

(4) Under the head of injuries are included all causes which can produce a sudden detachment of part or the whole of the ovum. The chief of these are falls, blows on the abdomen, the passage of instruments into the uterus, sudden increase of blood-pressure, as may occur in consequence of severe mental emotion or excitement, convulsions, vomiting, straining, or sudden exertion of any kind.

(B) **Causes which bring about the Death of the Ovum.**—The most important of these causes is syphilis directly transmitted to the ovum either by the mother or by the father. Chronic lead-poisoning of either parent may act in a similar manner. Most of the poisons mentioned above in Group (A) may also cause abortion by directly causing the death of the ovum. Decidual endometritis and vesicular mole may act in a similar manner by causing degeneration of the ovum.

Varieties.—The most satisfactory classification of abortion for practical purposes is obtained by grouping cases according to the treatment which they require. By doing this, we obtain the following varieties :—

(A) Threatened abortion :—(1) That does not require active treatment. (2) That requires active treatment.

(B) Cervical abortion.
(C) Incomplete abortion.
(D) Complete abortion.
(E) Missed abortion.

(A) Threatened Abortion.—When a woman, who is in the first three months of pregnancy, commences to bleed, the hæmorrhage may be due to an extra-uterine pregnancy, or to a threatened abortion. The diagnosis between the two conditions will be discussed later (*v.* page 358). If it is a case of threatened abortion, there is probably more or less pain of a colicky nature, and, if a vaginal examination is made, the cervix may be found to be somewhat shortened, and the os partially dilated.

Treatment.—According as the hæmorrhage is slight or is severe, so the patient will not or will require active treatment. The question of active treatment is entirely decided by the rate and strength of the pulse, and by the appearance of the patient. It is never possible to say whether a threatened abortion is inevitable or not, unless a portion of it has left the uterine cavity. It is always possible to say whether a patient has lost as much blood as we consider safe. If it is a case which does not require active treatment, we endeavour to stave off the threatened abortion. With this object in view the patient should be kept at rest in bed, until all hæmorrhage and pain have ceased for three or four days, and opium may be given to relieve the pain. The liquid extract of hydrastis canadensis also may be used (*v.* page 297).

If, on account of the hæmorrhage, we believe the

case to require active treatment, one of two methods must be adopted:—the ovum must be removed by the finger or a curette; or the vagina must be plugged. These methods are not alternatives; if it is possible to adopt the first we should do so; if we cannot, the second method must be adopted. If this rule is followed, we shall plug the vagina in somewhat less

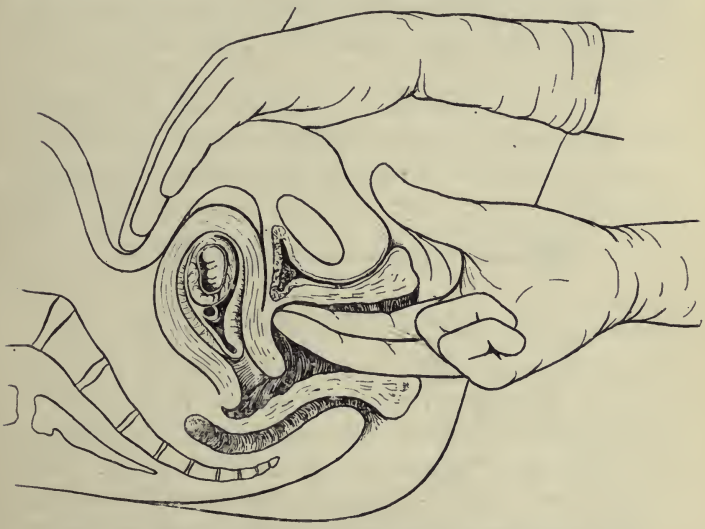


Fig. 128.—Bimanual method of expressing a detached ovum.

than one per cent. of cases of abortion requiring active treatment. It is possible to empty the uterus immediately, if the os will admit one finger, or even a curette. The former is to be preferred, as it removes the ovum more completely. Pass as much of the hand as is necessary into the vagina, and one finger into the uterus. Detach the ovum with the finger. Then remove the finger from the uterus, and

place it under the fundus; *i. e.* in the anterior fornix, if the uterus is normal in position; in the posterior fornix, if the uterus is retroverted. Sink the other hand into the abdomen, and compress the fundus between the two hands (*v.* Fig. 128). The ovum is thus driven out of the uterus into the vagina and removed. The uterus should then be well douched with hot creolin solution. If proper aseptic precautions have been used, the case will give no further trouble.

If the os is not large enough to admit a finger, fix the cervix with an American bullet-forceps, and curette away the ovum with Rheinstädter's flushing curette (*v.* Fig. 129). In the small proportion of

Fig. 129.—Rheinstädter's flushing curette.

cases in which the os is not large enough to admit even a curette, and the hæmorrhage is so severe as to require treatment, the vagina must be plugged with sterilised cotton-wool or iodoform gauze. The plug is left in for twelve to twenty-four hours, and then taken out. The os will then be found to be sufficiently dilated to permit the removal of the ovum with the finger. The dangers of plugging the vagina, unless the plugging is aseptically performed, are considerable, and, even if the plug itself is aseptic, blood may stagnate above it and putrefy. The decomposition then extends to the uterus, and, though the patient seldom actually dies as a result of this, she is frequently left an invalid for years, from tubal disease and pelvic peritonitis. In order

to prevent the accumulation of blood above the plug, it is advisable, in all cases in which the os is sufficiently dilated, to plug the uterine cavity as well as the vagina.

(B) CERVICAL ABORTION.—This condition occurs when the ovum is displaced from its situation in the uterus, and is expelled into the cervix. The external os does not dilate to allow it to pass, and the internal os contracts to some extent above it. It is thus retained in the cervix.

Treatment.—Incise the external os bilaterally, and so make it sufficiently large to allow the passage of the ovum; then, express the ovum in the ordinary manner; and, lastly, stitch up both incisions. One stitch at each side is usually sufficient.

(C) INCOMPLETE ABORTION.—An incomplete abortion consists in the coming away of any part of the ovum, the remainder being retained in the uterus.

Treatment.—As soon as the condition is recognised, turn the incomplete into a complete abortion, *i. e.* remove what is left behind. If the case is seen immediately after the portion of ovum has come away, and the os is still dilated, attempt to express the remainder of the ovum as directed above. If this fails, and if the os is sufficiently dilated, introduce the finger, and detach and express the ovum. If this fails, or if it cannot be performed owing to the contraction of the os, curette the uterus carefully with a blunt Rheinstädter's curette, having previously dilated the cervix if necessary. Never use a sharp curette in these cases, unless they are of

long standing and the uterus comparatively firm, as it is very easy to curette away the soft muscle-fibres. Never plug the vagina in the case of an incomplete abortion, as decomposition is certain to occur above the plug. On the other hand, it is sometimes very useful to plug the utero-vaginal canal with iodoform gauze, after the uterus has been emptied, in cases of continued hæmorrhage, or where there is decomposition proceeding inside the uterus.

The expectant treatment of incomplete abortion is only mentioned to be condemned. It consists in waiting until one of three things happens :—

(1) The remainder of the ovum comes away. This is the most favourable termination, but it is not the commonest.

(2) The ovum decomposes.

(3) The patient loses so much blood, that it is considered inadvisable to allow her to lose any more.

If either the second or third termination occurs, then, and only then, is the uterus emptied. This is extremely bad treatment. It is much more dangerous to remove an ovum which is decomposed, than one which is not. Again, a woman, who is weakened by repeated hæmorrhage, is more liable to become septic than one who has the normal quantity of blood in her body.

(D) Complete Abortion.—A complete abortion consists in the coming away of the entire ovum. It requires no special treatment.

(E) Missed Abortion.—An abortion is said to be

missed when the ovum dies, but is not expelled. It may be retained in the uterus for some weeks, or even longer.

Symptoms.—The patient has obviously been pregnant. The uterus has increased to a certain size, but now has ceased to enlarge. The signs of pregnancy disappear, the uterus diminishes in size, and the breasts become flaccid. If the membranes rupture, the fœtus putrefies and causes a sanious discharge.

Treatment.—Dilate the cervix and empty the uterus with the finger or with a curette.

Diagnosis.—The diagnosis between ectopic gestation and abortion will be discussed in the next chapter. We shall now only consider the diagnosis of the different varieties of abortion. To enable us to form this diagnosis two points must be attended to :—

(1) The nurse must keep everything that comes away from the patient *per vaginam*.

(2) The medical attendant must inspect such dejecta carefully with a view to discovering :—(*a*) whether the case is one of abortion; and, if so, (*b*) whether it is complete, (*c*) or incomplete.

If nothing but blood comes away, the case may be a threatened abortion, or it may be an extra-uterine pregnancy. If either a fœtus or chorionic villi are found among the discharged matter, it must be a case of abortion. If the whole ovum has come away, it is a complete abortion; if only a part of it has come, it is an incomplete abortion. In many cases of abortion, unfortunately, everything that has come away has been thrown out by the patient's friends or by the nurse. Then we have to rely on

the history of the patient, and on the results of a vaginal examination. The former is unreliable, and, consequently, we must depend almost entirely upon the latter. Two points will aid us :—

(1) The shape of the vaginal portion of the cervix.

(2) The continuance of hæmorrhage.

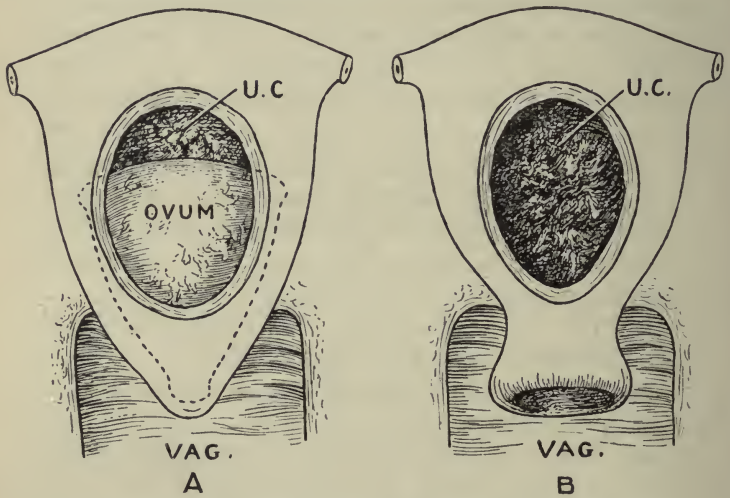


Fig. 130.—Diagram representing the shape of the cervix. A. during, and, B, subsequent to, the expulsion of the ovum. U.C. Uterine Cavity.

(1) The shape of the cervix varies, according as the ovum is in the act of distending the cervix, or has already been expelled. In the first place, the cervix is cone-shaped, with the base of the cone above, *i. e.* in the region of the os internum. This is due to the presence of the ovum in the cervix ;— the os internum is dilated, the os externum closed

(*v.* Fig. 130). In the second case, the cervix is cone-shaped with the base of the cone below, *i. e.* in the region of the os externum, and the apex above. This is due to the fact that the os internum has closed again, whilst the os externum is still patulous.

(2) If the hæmorrhage has ceased and the os internum is contracted, the ovum has most likely been expelled. If, on the contrary, the hæmorrhage continues, and, particularly, if there is a sanious discharge, some portion of the ovum must have been left behind. In cases of doubt, our treatment is governed by the symptoms. If there is constant bleeding, the uterus must be explored, whether there is an ovum there or not. If there is no hæmorrhage, and we do not know the exact condition present, it is better to wait.

MISCARRIAGE.

A miscarriage or *partus immaturus* is the term applied to the expulsion of the ovum after the placenta is formed, but before the fœtus is viable, *i. e.* before the twenty-eighth week. These cases resemble full-term labour, and usually follow a similar course. Before the fourth month, the ovum is almost universally attached to the uterus by vascular adhesions ; accordingly, the detachment of any part of it causes free hæmorrhage. After the fourth month, the placenta is fully formed, and is the only vascular link between the uterus and the ovum. If uterine contractions occur, the os dilates, the membranes rupture, the fœtus is discharged, and the placenta and membranes follow. Consequently,

hæmorrhage is not a necessary accompaniment of such cases.

Ætiology.—The causes of a miscarriage are almost identical with the causes of abortion (*v.* page 333).

Symptoms.—The symptoms are similar to those of labour (*v.* page 148).

Treatment.—The case is treated in the same manner as a full-term labour. The fœtus is born, and we wait the usual time for the placenta to follow. If it remains behind, it is expressed, bimanually if necessary, or if that fails it is removed by the hand.

It sometimes happens that in pelvic presentation the cervix contracts round the neck of the fœtus and prevents the delivery of the head. In such cases traction on the body may succeed in drawing the head through. The force of the traction must depend upon the condition and size of the fœtus, as in the case of a dead fœtus too vigorous traction will readily result in pulling the body away from the head. If such an accident occurs, the head may be expressed, or, if small, may be caught and pulled through the cervical canal with a pair of ovum forceps, or similar contrivance. If it is large, the finger may be passed into the mouth and the head hooked down. Failing this, it may be necessary, in the case of a large head, to seize it with a cranioclast, and thus extract it, but the necessity for such a procedure is very rare.

The after-treatment of a miscarriage is identical with that of a full-term labour. As in the case of abortion, the patient should be examined in from four to six weeks after the expulsion of the ovum

in order to determine, if possible, the cause of the occurrence.

PREMATURE LABOUR.

Premature labour, or *partus prematurus*, is the term applied to the expulsion of the ovum after the fœtus has become viable, but before full term, *i. e.* after the end of the seventh month, and before the end of the tenth.

Causes.—Premature labour may be caused by most of the conditions or diseases which give rise to abortion. The most important of these are the intra-uterine death of the fœtus, syphilis, Bright's disease, and injuries. In addition, there are other causes to be taken into account. The chief of these are detachment of the placenta, usually as a result of its insertion in the lower uterine segment; over-distension of the uterus, as in hydramnios and multiple pregnancy; premature rupture of the membranes; and eclampsia.

Symptoms.—The symptoms of premature labour differ but little from those of full-term labour. The dilatation of the cervix may be slow, as the cervical tissues are not so soft as at full term. On the other hand, the expulsion of the fœtus is more rapid. Malpresentations are slightly more common than at full term.

Treatment.—The treatment of the case is identical with that of normal labour. The infant must be kept warm after birth, and should, if possible, be placed in an incubator. The management of a premature infant will be subsequently described.

DELAYED LABOUR.

Delayed labour, or *partus serotinus*, is the term applied to labour when it occurs more than forty-one weeks after conception. This is not a condition to which it is necessary to refer at any length, as labour under these circumstances does not differ from labour at full-term unless the fœtus continues to grow, and so offers an obstacle to delivery owing to its increased size.

Connected with *partus serotinus* is another and very rare condition, known as "missed labour," the term applied to the condition which results when labour does not occur spontaneously. In such a case, the fœtus dies, and the liquor amnii is gradually absorbed. Finally, if the ovum is retained for sufficient length of time, maceration, mummification, or, if putrefactive bacteria gain entrance to the uterus, putrefaction of the fœtus may occur. If the fœtus is retained for a very long time, a deposit of lime salts on the epidermis may lead to the formation of a calcified covering which invests the fœtus. To this condition the term *lithopædion* has been applied. In other cases of long retention, the fœtus becomes completely disorganised, and is found as a mass of adipocere and bones.

Symptoms.—The symptoms to which missed labour gives rise are the result of the death of the fœtus, and of the absorption of poisonous matter from the uterus.

Diagnosis.—Missed labour has to be distinguished from the retention of a dead full-term fœtus in the sac of an extra-uterine pregnancy. In both cases

the symptoms and history are very similar, but, by a careful examination, it will be possible to determine that in the case of a missed labour the fœtus is retained in the uterus, while in the case of an extra-uterine pregnancy the uterus is empty. It may be difficult to map out the uterus as a separate tumour in a case of extra-uterine pregnancy, but the passage of the sound will enable us to ascertain its position and contents, or, if necessary, the cervix may be dilated with tents and the cavity explored with the finger. As the fœtus is obviously dead, and full term passed, there is no contra-indication to either of these proceedings.

Treatment.—The treatment consists in dilating the cervix and removing the fœtus. The cervix may be dilated at first with tents, and then further dilatation obtained by the use of Frommer's or of Barnes' dilators. In some cases, the dilatation of the cervix may bring on uterine contractions, and the fœtus be expelled. If contractions do not occur, the fœtus is extracted by traction on the leg, podalic version if necessary being first performed. If the case is one of long duration, and the fœtus is completely disorganised, the cervix must be dilated as far as possible, and the remains of the fœtus removed by the hand passed into the uterus.

CHAPTER XX.

EXTRA-UTERINE PREGNANCY.

Course of Pregnancy—Varieties—Ætiology—Before Rupture of the Tube: Symptoms, Diagnosis, Treatment—At the Time of Rupture: Symptoms, Diagnosis, Treatment—After Rupture: Symptoms, Diagnosis, Treatment—Result of Fœtus remaining in the Abdomen—Table showing the Varieties of Extra-uterine Pregnancy and their Treatment.

Extra-uterine or ectopic pregnancy is the term applied to the development of the ovum outside the uterus. In the vast majority of cases, this occurs, at first, in some part of the lumen of the tube, but it has also occurred in the ovary.

Course of Pregnancy.—It will, perhaps, assist the student in understanding this subject if we briefly describe the usual course of events which occur in a tubal pregnancy. The impregnated ovum lodges in one of three sections of the tube (*v.* Fig. 133), and grows there. If it lodges in the interstitial section, the growing ovum encroaches on the uterine cavity; if in the isthmus, the enlarging tube separates the folds of the broad ligament; and if in the ampulla, the ovum may protrude through the abdominal ostium of the tube. At some date, usually between the sixth and the twelfth week, the tube has reached the maxi-

mum degree of distension that it is capable of, and, in consequence of the further growth of the ovum, or of the eroding action of the trophoblast on the tubal wall, it ruptures. In the case of an interstitial pregnancy, this rupture may take place in one of three directions:—into the uterine cavity, into the peritoneal cavity, or between the separated layers of the broad ligament. In an isthmial pregnancy, rupture may take place in one of two directions:—into the peritoneal cavity, or between the separated layers

Fig. 131.—Fallopian tube which has ruptured at about the second month of pregnancy. (From a specimen.)

of the broad ligament. In an ampullar pregnancy, rupture can occur only into the peritoneal cavity, but another termination is in this case also possible —*i. e.* the expulsion of the ovum through the dilated ostium of the tube into the peritoneal cavity without any rupture occurring—the so-called "tubal abortion."

Rupture of the tube has two important consequences—the occurrence of hæmorrhage, and the partial or complete detachment of the ovum. If the tube ruptures into the uterine cavity, the case will in all probability be mistaken for an abortion, and

will cause similar symptoms. If the tube ruptures into the abdominal cavity, or if the ovum is expelled into the cavity, more or less profuse intra-peritoneal hæmorrhage occurs. If the escaped blood becomes encysted in Douglas' pouch, the condition is spoken of as a retro-uterine hæmatocele. If the blood does not become encysted, the condition is spoken of as diffuse intra-peritoneal hæmorrhage. If the tube

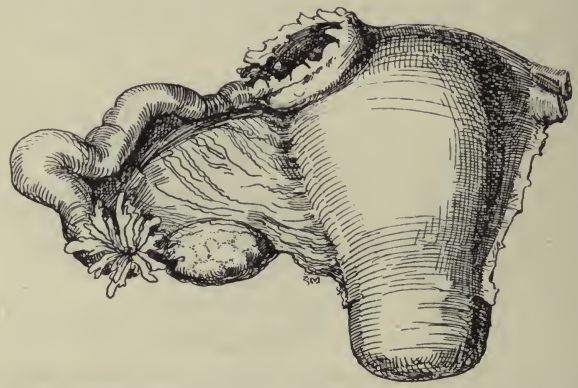


Fig. 132.—Uterus and tube, showing at the right uterine cornu the site of a ruptured interstitial pregnancy. (From a specimen.)

ruptures into the layers of the broad ligament, the hæmorrhage is extra-peritoneal. If the escaped blood does not travel beyond the broad ligament, the condition is termed hæmatoma of the broad ligament. If, on the other hand, it burrows its way through the sub-peritoneal connective tissue, diffuse sub-peritoneal hæmorrhage results. Finally, if the blood becomes encysted either intra- or extra-peritoneally, the amount lost will not be very great, or, at any rate, will not be sufficient to cause the death

of the patient. If, on the other hand, the hæmorrhage is diffuse, the life of the patient will almost certainly be lost unless the hæmorrhage is checked.

The second important consequence of rupture is the effect it produces on the position of the ovum. If the ovum is completely detached when the tube ruptures, it almost certainly dies ; if, on the contrary, a sufficient portion of it remains attached to furnish the embryo with the necessary amount of oxygen and nutriment, the fœtus may live and the ovum continue to grow. In such cases, the subsequent history very largely depends upon the site of the original rupture. In an interstitial pregnancy that ruptures into the uterus, it is conceivable that the ovum may not be detached and that pregnancy may continue, the ovum growing out into the uterine cavity, and the case practically becoming one of intra-uterine pregnancy. If the tube ruptures into the peritoneal cavity, and the ovum continues to live, the primary tubal pregnancy is gradually altered into what is known as a secondary abdominal pregnancy. The ovum gradually extends into the abdominal cavity, and the placenta spreads beyond the limits of the tube until it covers the peritoneal surface of the uterus or of the intestines, and part of the pelvic or parietal peritoneum. If, on the other hand, the tube ruptures between the layers of the broad ligament, and the ovum survives that event, the latter gradually extends into the layers of the broad ligament, and the primary tubal pregnancy is altered in this case into a secondary broad ligamentous pregnancy, or mesometric pregnancy, as it is sometimes termed.

If a secondary abdominal pregnancy results, the

remainder of the course of pregnancy may be comparatively uneventful. If, however, a broad ligamentous pregnancy results, the course of pregnancy is usually interrupted by a second rupture of the gestation sac. In a broad ligamentous pregnancy, the ovum grows between the layers of the broad ligament, which is pushed upwards and outwards. As the peritoneum is very elastic, it stands this distension for some time, but in some cases it finally becomes over-distended, as in the case of the tube, and ruptures. The consequences of this largely depend upon the situation of the placenta. If, as is perhaps most frequently the case, the placenta is situated above the ovum—that is, towards the top of the broad ligament, it will probably be involved in the rupture, and the most serious hæmorrhage will result, almost certainly leading to the death of the patient. If, however, the placenta is situated beneath the ovum, rupture of the thinned-out upper layers of the broad ligament can occur without involving it, and consequently without causing a fatal hæmorrhage. In such a case, the broad ligamentous pregnancy becomes converted into an abdominal pregnancy.

In cases in which the ovum survives the rupture of the gestation sac, there are no further special symptoms until full term is reached. Then, a form of false labour may be set up, the uterus expels a decidual cast of its cavity, and the fœtus dies. If the dead fœtus is allowed to remain in the abdominal cavity, putrefaction, or the formation of a lithopædion may result. If putrefaction occurs, an abscess will result and burst into some of the hollow viscera or

through the parietes. Such an abscess may continue to discharge for years, if the patient lives, and during that period fragments of the fœtus will come away piecemeal. In cases in which putrefaction and suppuration have not occurred, women have been known to carry about the remains of a full-term fœtus for upwards of forty years.

Varieties.—From the foregoing sections it will be seen that the different forms under which extra-uterine pregnancy is met, can be classified as follows :—

I. Primary forms
- tubal
  - interstitial.
  - isthmial.
  - ampullar.
- ovarian

II. Secondary forms
- from the interstitial
  - uterine.
  - abdominal.
- from the isthmial
  - abdominal.
  - broad ligamentous.
- from the ampullar — abdominal.
- from the ovarian — abdominal.

Ætiology.—The cause of ectopic pregnancy is a matter of much uncertainty. It is probable that under normal circumstances the fertilisation of the ovum may occur anywhere between the ovary and the cervix, and consequently it is probable that spermatozoa may frequently find their way into the Fallopian tubes. If fertilisation occurs in the tube, the fertilised ovum passes along into the uterus and becomes embedded there. If, however, any abnormal condition interferes with the lumen of the tube to such an extent that the fertilised ovum cannot pass

along it, the latter either dies or becomes embedded in the tube and forms the starting-point of a tubal pregnancy. Accordingly, the probable cause of tubal pregnancy may be stated in general terms to be some condition which causes the permanent arrest of a fertilised ovum somewhere in its passage between the ovary and the uterus. Such a condition may be found in inflammations of the tubal mucosa, diverticula, exaggerated convolutions of the tube, accessory fimbriated extremities, cicatricial bands compressing the tube and intra-tubal tumours.

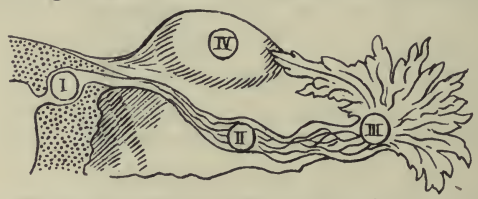


Fig. 133.—Diagram representing the various situations in which a primary extra-uterine pregnancy may develop: (1) interstitial; (2) isthmial; (3) ampullar; (4) ovarian. (Modified from the 'Norris Text-book of Obstetrics.')

In discussing extra-uterine pregnancy, we shall refer to tubal pregnancy alone, as, although a few undoubted cases of ovarian pregnancy have been met with, such an occurrence is not of sufficient frequency to be of practical importance. The symptoms, diagnosis, and treatment will be discussed under three heads:—

(A) Before,
(B) At the time of,
(C) After, primary rupture of the tube.

(A) **Before Primary Rupture of the Tube.**

Symptoms.—The patient believes herself to be

pregnant, and displays all the subjective and objective symptoms of early pregnancy. She has missed one or two monthly periods, and then slight irregular hæmorrhages occur. At the same time she complains of cramp-like pains in the lower part of the abdomen. Frequently, a history of previous sterility can be obtained. On vaginal examination a tumour is felt at one or other side of, or behind, the uterus, apparently attached to one uterine cornu. It varies in size from that of a hen's egg, to that of an orange. It is unilateral, and is traversed by large blood-vessels, which can be felt pulsating through the vaginal fornix. The uterus is found to be enlarged.

Diagnosis.—The condition has to be diagnosed from a case of threatened abortion, complicated with a sactosalpinx (*i. e.* a dilated tube) or an ovarian tumour. The marked pulsation of the tumour, the fact that it is unilateral, and the history of the case, are the most important guides. A pyosalpinx is almost always bilateral.

Treatment.—Treat the case as if it was a malignant tumour, and remove it by abdominal or vaginal cœliotomy, as may be thought best.

(B) **At the Time of Primary Rupture of the Tube.**

Symptoms.—The first symptoms of rupture are those of internal hæmorrhage,—intense pain and sudden collapse, in proportion to the amount of internal hæmorrhage. The pulse is feeble and usually rapid, but, on the other hand, it may be very slow. The temperature falls to 95° or 96° F. (35°–35·5° C.). At the same time, or a little later, the

uterus usually expels a false decidua, which has been formed synchronously with the growth of the ovum, and there is accompanying hæmorrhage. The succeeding symptoms depend on what has happened, or is actually happening, inside the abdomen. As we have seen, the tube may rupture intra-peritoneally or extra-peritoneally. In the latter case the hæmorrhage usually is soon checked by the pressure of the tissues of the broad ligament, and the symptoms abate; very rarely profuse subperitoneal hæmorrhage may occur. The former case—intra-peritoneal rupture—is far more serious. If it occurs, two terminations are possible:—

(1) Diffuse hæmorrhage occurs into the abdominal cavity. This is rapidly fatal unless checked.

(2) A retro-uterine hæmatocele forms. This is the more favourable termination.

If a vaginal examination is made, at the time of rupture, nothing peculiar is felt. If the existence of a tubal enlargement has been recognised previously, we may be able to determine its disappearance. In cases in which the hæmorrhage is limited by adhesions, a retro-uterine tumour will subsequently be felt.

Diagnosis.—The diagnosis has to be made from a threatened, or incomplete abortion, for one or other of which a ruptured tubal pregnancy is very frequently mistaken. The first point which should attract our attention, is the marked disproportion between the condition of the patient, and the amount of *apparent* hæmorrhage which has occurred. The patient apparently has lost only a little blood, but she is anæmic, collapsed, with a feeble pulse, and a

low temperature. Then, the decidua, which has been expelled, should be examined. No trace of chorionic villi or of a fœtus will be found.

If a hæmatocele forms, it is most important to be able to recognise it (*v.* Fig. 134). As felt from the rectum, it is a tumour which fills Douglas' pouch, boggy in consistency, and with a dome-shaped upper

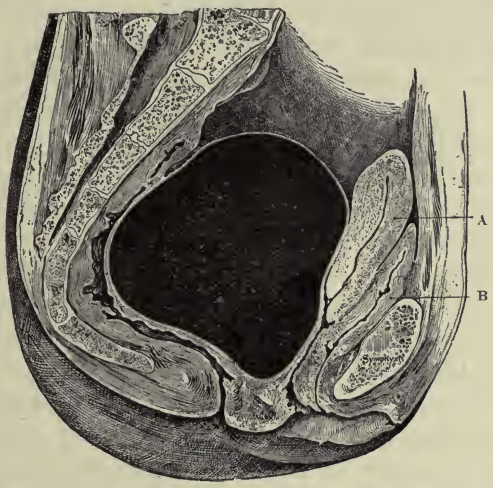


Fig. 134.—Diagram showing the effects of a retro-uterine hæmatocele. (*Skene.*) (The relations of the bony parts in the diagram must not be regarded as typical.) A. Uterus. B. Bladder.

surface. It invests the rectum, and the uterus can be felt anteposed. It is by recognising the fact that the uterus is anteposed, that a hæmatocele is distinguished from a retroverted pregnant uterus, for which it is most likely to be mistaken. If there is any doubt, the sound should be passed, as the result of a false diagnosis may be disastrous on account of the very different treatment required by the two

conditions. The treatment for a retroverted pregnant uterus is to replace it; whilst any attempt to move a hæmatocele would lead to fresh hæmorrhage, and perhaps directly cause the death of the patient.

Treatment.—This depends upon the nature of the case. If the patient is seen shortly after rupture has occurred, and the condition is recognised as one of diffuse hæmorrhage, the only treatment possible consists in opening the abdomen and tying and removing the ruptured tube. This treatment is indicated in every case, unless the patient is actually moribund, as the only chance of saving her life is the immediate checking of the hæmorrhage by ligature of the bleeding vessel.

If the case is not seen until a hæmatocele has formed, the correct subsequent treatment is more a matter of discussion. Some writers recommend the abdomen to be opened in all cases, and the hæmatocele to be cleared out. Others wait, on the chance of the hæmatocele being absorbed aseptically, and operate only if a rising temperature shows that suppuration is occurring. The latter is probably the better treatment to adopt in the case of a small hæmatocele. In the case of a large hæmatocele, on the other hand, the danger of putrefaction or suppuration taking place is so positive that immediate operation is advisable. Also, if the pregnancy has reached the fourth month, and consequently there is a placenta and a fairly large fœtus, it is better to operate in all cases. If it is determined to operate while the escaped blood is still aseptic, it is better to do so by the abdominal route, especially

if we have reason to believe that there is a placenta. If, however, suppuration has occurred, the abscess should be opened *per vaginam*, and all pus, clots, etc., should be cleared out of Douglas' pouch without breaking through the limiting adhesions which separate the space in which they are lying from the general peritoneal cavity.

(c) **After Primary Rupture of the Tube.**—As has been shown above, certain consequences may follow the primary rupture of the tube. These are :—

(1) The patient may die, as a result of the hæmorrhage.
(2) The ovum may die and be absorbed, or may be removed at the time of operation.
(3) The ovum may survive the rupture and continue to develop.

The last case most frequently happens in extra-peritoneal rupture of the tube. It more rarely occurs in cases of intra-peritoneal rupture. It is with this condition we are now concerned ; that is, the symptoms and treatment of a case of extra-uterine pregnancy, in which the ovum survives the primary rupture of the tube.

Symptoms.—When the ovum escapes into the broad ligament after primary rupture of the tube, and survives that event, the condition is known as a mesometric pregnancy. The peritoneum, which forms the broad ligament, now occupies the relationship to the ovum which the tube formerly did, and, consequently, as the ovum grows, it is liable to share a similar fate, *i. e.* secondary rupture may occur. We have already referred to the consequences of this (*v.* page 354).

If the ovum survives the secondary rupture, or if the case is one in which primary rupture occurred into the abdominal cavity, and not into the layers of the broad ligament, there are no special symptoms to call attention to the condition of affairs until full term is reached. As soon as this occurs, spurious labour may set in and the uterus may expel a decidual cast of itself, and the child dies. The patient notices nothing further for a few weeks, when she may begin to think that she is past her proper time for delivery. She also notices that her abdomen is smaller, a change which is due to the absorption of the liquor amnii. If the condition is not relieved, the abdomen continues to decrease in size, and the patient at the same time becomes gradually weaker. She suffers from various subjective sensations, such as a bad taste in her mouth, nausea, shiverings, and pains in her abdomen.

Diagnosis.—It is a very difficult matter to decide, for certain, in the later months of pregnancy, whether the ovum is contained in the uterus or in the abdomen. It is very difficult to distinguish between the uterus and the extra-uterine ovum, owing to the distension of the abdomen; and there is an obvious objection to the use of the sound. It is said that the absence of the painless contractions of the uterus as felt by the hand, and of the uterine souffle, are points of importance. But, inasmuch as the woman has, often, no symptoms which call attention to her condition before the normal period of termination of pregnancy, she is seldom sufficiently carefully examined to bring out these points. Consequently, the diagnosis is frequently not made until it is

obvious that she is considerably past her normal time for delivery. Then, the diminished size of the ovum may allow the uterus to be felt as a separate tumour. The introduction of the sound determines the diagnosis; this is now permissible, as the child is dead, and the patient must be delivered, whether the pregnancy is intra- or extra-uterine.

Treatment.—If secondary rupture occurs, the abdomen must be immediately opened, with the object of checking the hæmorrhage and removing the fœtus. If the placenta was lying above the fœtus and was involved in the rupture, the death of the patient will probably occur before assistance can be obtained. If secondary rupture does not occur, it will still be necessary to remove the fœtus and placenta; the only question is, when ought the operation to be performed? If the nature of the case is recognised before the death of the fœtus, are we to endeavour to save the latter? The general opinion is, that it is better not to regard the life of the child in these cases, but to consider only the mother. Children developed outside the uterus are usually weak and likely to die, even if extracted alive; whilst the danger of the death of the mother from hæmorrhage, if the operation is undertaken at full term, is very great. The best rule to follow is this:—If the condition is recognised whilst the placenta is still small, *i. e.* in the fourth or fifth month, operate at once. If, on the other hand, the condition is not discovered until after this period, it is better to wait for a month, or even two, after full term, and then to operate. By this time the maternal blood-vessels, which supply

the placenta, have diminished in size, and there is less risk of hæmorrhage. For the details of the operation itself, we refer the reader to one of the large text-books on obstetrics. It is one of the most difficult operations met with in abdominal surgery. The chief troubles are the difficulty of dealing with the placenta, and the separation of the numerous adhesions, which may form between the ovum and the intestines. It suffices to say here, that, if possible, the placenta must be removed, as there is the gravest risk of its decomposing if left behind.

Terminations.—Cases of extra-uterine pregnancy, which have advanced to full term, if untreated, may terminate in several ways. The fœtus may undergo :—

(1) Maceration, mummification, calcification, saponification ; or

(2) Suppuration.

If any of the terminations in the first group occur, the child may be carried by the mother for years. A *lithopædion* is the term applied to the condition that arises, when the membranes become the seat of calcareous deposits. The mother's health is always affected at first, probably owing to absorption from the dead child. Afterwards, as the fœtus becomes dried up, it only causes inconvenience by its size and weight. If the fœtus decomposes or suppurates, the result is very different. A general suppurative peritonitis may start, and cause the death of the patient ; or a localised abscess may be formed. In the latter case, the abscess bursts, either externally, or into one of the hollow viscera. It will continue discharging, perhaps for years, until

either the patient dies of exhaustion or amyloid disease, or the entire ovum is discharged piecemeal. She may then recover; but such cases are rare.

The accompanying table may be of some use to the student, in understanding this complex subject (*v.* the next page).

An extra-uterine pregnancy is most frequently	If untreated, this condition will terminate, before the end of the third month, in	This termination may cause respectively	If this resultant condition is untreated it will terminate in	The best line of treatment consists in
Tubal	(*a*) Intra-peritoneal rupture.	(*a*) Diffuse hæmorrhage into the peritoneal cavity.	The death of the patient.	Immediate cœliotomy, and ligature of bleeding vessels.
		(*b*) The formation of a retro-uterine hæmatocele.	(*a*) Aseptic absorption.	Rest in bed.
			(*b*) Suppuration.	Cœliotomy and evacuation of the septic clots.
		(*c*) Slight hæmorrhage, the ovum surviving.	Full-term extra-uterine pregnancy.	Cœliotomy after term, and removal of the fœtus.
	(*b*) Extra-peritoneal rupture.	(*a*) Profuse hæmorrhage into the tissues of the broad ligament, extending sub-peritoneally.	The death of the patient.	Immediate cœliotomy, and ligature of the bleeding vessels.
		(*b*) The formation of a hæmatoma.	Aseptic absorption.	Rest in bed.
		(*c*) Slight hæmorrhage, the ovum surviving.	Full-term extra-uterine pregnancy.	Cœliotomy after term, and removal of the fœtus.
			Secondary rupture.	Immediate cœliotomy.

CHAPTER XXI.

ANTE-PARTUM HÆMORRHAGE.

Varieties—Hæmorrhage during fourth, fifth, and sixth months—Accidental hæmorrhage: Varieties of Accidental Hæmorrhage—Concealed Accidental Hæmorrhage—External Accidental Hæmorrhage: Treatment by plugging the Vagina, Other Modes of Treatment—Unavoidable Hæmorrhage: Treatment by Braxton Hicks' Method, Other Modes of Treatment—Fœtal Mortality in Ante-partum Hæmorrhage.

Ante-partum hæmorrhages, due to rupture of the vascular connections between the fœtus and the uterus, may be divided into three main classes, according to the period of pregnancy at which they occur :—

I. Hæmorrhages occurring during the first three months, *i. e.* before the full formation of the placenta.

II. Hæmorrhages occurring during the second three months.

III. Hæmorrhages occurring during the last four months.

I. This class has been already discussed (*v.* page 335).

II. Hæmorrhage coming on during the fourth, fifth, and sixth months of pregnancy is not of very

common occurrence. When it does occur it is sometimes difficult to treat.

Ætiology.—The hæmorrhage may be due to :—

(1) Detachment of the placenta.

(2) Degeneration of the ovum.

(1) From a theoretical point of view these cases could be subdivided, as will be done in Class III, into hæmorrhage due to the detachment of a normally or of an abnormally situated placenta. From a practical point of view, however, such a division would be useless, as it is impossible to distinguish between them prior to the expulsion of the ovum. Accordingly, although this distinction must be taken into account in considering the ætiology of the hæmorrhage, from the point of view of the treatment of the patient it is of no importance.

The detachment of the placenta may be due to :—

(*a*) Its abnormally low insertion.

(*b*) Nephritis.

(*c*) Syphilis.

(*d*) Endometritis.

(*e*) Placental infarctions.

(2) Under this head the following causes of hæmorrhage are found :—

(*a*) Vesicular mole.

(*b*) Missed abortion, with the formation of a carneous mole.

The symptoms and treatment of vesicular mole have been already discussed (*v.* page 302).

Symptoms.—The symptoms vary, according to the condition of affairs present. In some cases the bleeding is constant but small in amount, in other cases it occurs at intervals in gushes, or most rarely

it may occur as a single attack of flooding, which, if not checked, may prove fatal. Again, the fœtus may die as a result of the placental detachment, if large in extent, or, on the other hand, its growth may continue. Lastly, the hæmorrhage may to a large extent be internal, *i. e.* it may be retained in the uterus, or it may be almost entirely external, *i. e.* it may pass through the cervical canal and vagina and appear externally. Accordingly, we find that, when the fœtus is dead, if the hæmorrhage is external the uterus gradually diminishes in size owing to the absorption of the liquor amnii ; if the hæmorrhage is internal the uterus may increase in size to a marked extent, owing to the retained blood. If the fœtus does not die, the uterus will increase in size only in proportion to the rate of fœtal growth, if the hæmorrhage is external ; but, if there is considerable internal hæmorrhage, the uterus will become larger than it ought to be for the period of pregnancy.

As might be expected, then, we find that, in the majority of these cases, the size of the uterus does not correspond to the period of pregnancy—it is usually larger but may be smaller, resembling the condition found in vesicular mole. The cervix is usually soft, and will admit the tip or the whole of the finger. The uterus is soft, unless the amount of internal hæmorrhage is very great, when it may be very hard. If the fœtus has been dead for any length of time, or if there is much blood in the uterus, it will be difficult to feel the fœtus *per vaginam*. If decomposition occurs inside the uterus, there will be a fœtid discharge and the usual symptoms of sapræmic infection. In proportion to the

amount of hæmorrhage, the patient will become progressively more anæmic and weaker.

Diagnosis.—The cause of hæmorrhage can rarely be determined without exploring or emptying the uterus. As this proceeding will of necessity terminate the pregnancy, the question to be answered is not so much what is the exact condition of affairs present, as whether it is necessary to empty the uterus or not.

Treatment.—If the hæmorrhage is slight, palliative treatment is to be adopted, the main essential of which is rest in bed. If there are no uterine contractions, ergot and strychnine may be administered in combination. Hydrastis Canadensis has also been recommended, but its value is questionable.

The conditions under which our treatment must become active are :—

(1) If it is obvious that the patient has lost as much blood as is safe.
(2) If the discharge is fœtid.
(3) If the fœtus is obviously dead.

Under these circumstances the uterus must be emptied.

If the indication for delivery is hæmorrhage, and if there is no intra-uterine decomposition, the simplest method of treatment consists in passing into the cervix as many sea-tangle tents as there is room for, choosing several small tents in preference to a couple of large ones, and then applying a firm vaginal plug below them. The plug and tents are removed in twenty-four hours, when, in some cases, the uterus will expel its contents of its own accord; in others, the process must be hastened by bringing down a foot.

If the discharge is fœtid, it is advisable to empty the uterus at once after rapid dilatation of the cervix, and not to lose time in gradual dilatation. With the patient under an anæsthetic dilate the cervix with Hegar's dilators to a size sufficient to admit one finger. Then, feel for a foot, with the finger in the uterus, and bring it down into the vagina—if necessary after further dilatation of the cervix with the fingers. Gentle traction is then made on the leg. If the fœtus is small it can be delivered at once, if in the sixth month the proceeding will take some little time. Frommer's dilator will, probably, be of considerable use in these cases, as it enables the necessary degree of dilatation of the cervix to be obtained.

In cases in which it was found advisable to deliver the fœtus without waiting for dilatation of the cervix by tents, and in which pregnancy had not advanced much beyond the commencement of the fifth month, the author has derived considerable assistance from the use of Schultze's spoon forceps. This is passed into the uterus after preliminary dilatation of the cervix with Frommer's or Hegar's dilators, and the foot of the fœtus seized and pulled upon. The leg comes down a little way and then usually breaks. Then a fresh grip is taken higher up, and the fœtus again pulled down, and so on until finally the head is brought out, crushed, if necessary, by the spoon forceps. The fœtus is thus rapidly extracted, and with a minimum dilatation of the cervix.

If, after the fœtus is removed, the placenta does not follow, it must be taken away with the fingers. If after this uterine contraction is not good, and

there is still hæmorrhage, the uterus must be plugged with iodoform gauze. This latter proceeding is also advisable when the placenta or membranes are decomposed.

III. Hæmorrhage coming on in the last four months of pregnancy occurs as two distinct varieties :—

(1) Accidental hæmorrhage.

(2) Unavoidable hæmorrhage, or hæmorrhage due to placenta prævia.

ACCIDENTAL HÆMORRHAGE.

Accidental hæmorrhage is the term applied to the hæmorrhage which results from the detachment of a normally situated placenta.

Frequency.—It is difficult to obtain reliable statistics as to the frequency of accidental hæmorrhage, as the proportion of cases depends so much upon the limitations which are placed upon the term. If we consider that accidental hæmorrhage only occurs after the commencement of the seventh month, and if we only record cases in which hæmorrhage is sufficient in quantity to affect the treatment of the patient, we shall get a tolerably true estimation of its frequency. Estimating on this basis, in the Rotunda Hospital, amongst 25,790 patients, the relative frequency of accidental hæmorrhage was 1 in 128·4, *i. e.* 0·77 per cent.

Ætiology.—Accidental hæmorrhage is due to almost the same factors as is hæmorrhage occurring during the fourth, fifth, and sixth months. Perhaps

the most common causes are nephritis, placental infarction, and decidual endometritis.

Varieties.—There are two varieties of accidental hæmorrhage :—

(A) Concealed accidental hæmorrhage.

(B) External accidental hæmorrhage.

These differ from one another in the conditions which permit of their occurrence, and in the treatment which they require.

(A) **Concealed Accidental Hæmorrhage.**—This is perhaps, with the exception of acute sepsis, the most serious accident to which pregnant women are liable. It is, happily, very rare. In this condition, the blood which is poured out from behind the detached placenta is stored up in the uterus, which dilates in order to make space for it, and the patient can thus bleed to death, although no blood escapes into the vagina. However, in all probability, it is only a uterus which is the subject of advanced myo-metritis which will dilate to this extent before the blood-pressure. It is an obvious fact that blood can escape from a ruptured vessel into any cavity only so long as the pressure inside the cavity is less than the blood-pressure. If the escaping blood flows out of the cavity as quickly as it flows in, then an indefinite amount can be lost. If the blood cannot escape, then it must cease flowing as soon as the cavity is full. There is no room for any considerable quantity of blood to escape into a uterus, the muscle-fibre of which has its normal tone, *i. e.* is "healthy," and which is occupied by an unruptured ovum. If a vessel ruptures in such a case, and no blood escapes through the cervical canal, the pressure in the

uterus rapidly becomes equal to the blood-pressure, and the hæmorrhage ceases. If, on the other hand, the muscle-fibre of the uterus is diseased, and dilates before the blood-pressure, then the amount of the hæmorrhage is only limited by the capacity of the uterus to dilate.

This is an important fact to understand thoroughly, as it shows :—

(1) How concealed hæmorrhage occurs.

(2) The method by which external accidental hæmorrhage coming from a "healthy" uterus may be checked.

(3) How useless it would be to adopt this method in concealed accidental hæmorrhage, *i. e.* in the case of a diseased uterus.

Symptoms.—The symptoms of concealed accidental hæmorrhage are those common to any form of internal hæmorrhage. Collapse, falling temperature, weak and rapid pulse, severe abdominal pain, anæmic appearance,—all occur in proportion to the amount of blood which the patient is losing. At the same time the uterus increases in size, becomes tender to the touch, and there is an increasing difficulty in feeling the fœtus.

Treatment.—The only treatment which is of any avail in cases occurring before the onset of labour is *accouchement forcé*, or the removal of the uterus.

Accouchement forcé consists in rapidly dilating or incising the cervix, turning the presentation into a footling presentation if it is not one already, and then extracting the child by applying traction to the leg. If the hæmorrhage continues, the uterus must be plugged.

The choice between the two methods of treatment depends largely upon the skill and experience of the practitioner, and upon the circumstances under which the operation has to be performed. In a hospital, where all the requisites for performing major operations are present, the removal of the uterus may be the better method. If this treatment is chosen, supra-vaginal hysterectomy is usually performed. If it is decided to perform *accouchement forcé* instead of supra-vaginal hysterectomy, the use of Frommer's dilator will enable us to dilate the cervix more satisfactorily and more rapidly than was possible with the older methods, and so may perhaps improve the prognosis in these cases. The instrument deserves a full trial, as the results of manual dilatation and of hysterectomy are far from good.

If labour has commenced, the hæmorrhage will probably be checked, as in external accidental hæmorrhage, by rupture of the membranes accompanied by massage of the uterus. If this is not successful, and if the hæmorrhage still continues, the fœtus must be extracted.

(B) **External Accidental Hæmorrhage.**—This is also a very serious complication of pregnancy, although the prognosis is not nearly so bad as in concealed hæmorrhage. Usually, the blood escapes from the uterus as rapidly as it flows out of the ruptured vessels, and so the hæmorrhage is at once apparent. On the other hand, in many cases there is first a certain amount—greater or less as the case may be —of concealed hæmorrhage, which changes into external hæmorrhage as soon as the intra-uterine pressure becomes sufficiently great to overcome the

resistance to the escape of blood. The amount of internal hæmorrhage, which takes place before the external hæmorrhage commences, as shown by an increase in the size of the uterus, affords good evidence of the condition of the uterine muscle-fibre, as the better the tonicity of the muscle-fibres, the less the internal hæmorrhage, and *vice versâ*. If external hæmorrhage does not come on, either the bleeding ceases, owing to the increased intra-uterine pressure, or the case persists as one of internal hæmorrhage.

Symptoms.—The escape of blood is the most prominent symptom, accompanied or preceded by a varying degree of pain in proportion to the amount of concealed hæmorrhage which has, or is, occurring. If the condition is not treated, the usual symptoms of hæmorrhage follow.

Diagnosis.—The diagnosis has to be made from hæmorrhage due to placenta prævia, and, as a rule, it is easy to do so. Examine the patient vaginally; if the placenta can be felt through the os, or through the lateral fornices, it is a case of placenta prævia. If the placenta cannot be felt, it may possibly be a case of lateral placenta prævia, but it is to be treated as if it was a case of accidental hæmorrhage. The condition may also be diagnosed by abdominal palpation. If the head is found to be fixed in the brim, it is almost certainly not a case of placenta prævia.

Treatment.—The treatment, and to a great extent the prognosis of the case, depend upon whether the patient is having strong uterine contractions or not. If she is, the danger of the condition is greatly diminished, and the treatment is simple. If she is

not, the reverse is the case. The conditions, under which concealed hæmorrhage occurs, were pointed out above; and it was shown that there is no room for blood to be stored up in a "healthy" uterus if the ovum is intact. It is on this fact that the treatment, which we are about to describe, depends.

If we prevent the blood, which is escaping from behind the placenta, from leaving the uterus, the pressure inside the latter will rapidly become greater than the blood-pressure, and, as a result, the hæmorrhage will cease. How, then, can the escape of blood from the cervix be prevented? By tightly plugging the vagina, and so compressing the cervix. This will check the hæmorrhage, and at the same time bring on labour—the two results which we most wish for under the circumstances. At the same time labour is brought on gently, without causing any aggravation of the shock from which the patient is usually suffering, and so she is given ample time to rally from the collapse which the hæmorrhage caused, before the uterus empties itself.

To perform the operation of plugging, place the patient in the cross-bed position and wash and douche her thoroughly. Anæsthesia is not necessary, but is a great advantage. Then pass a posterior speculum, and with strips of iodoform gauze, soaked in lysol solution (0·5 per cent.), plug tightly round the cervix. The rest of the vagina is then plugged, as firmly as possible, with balls of absorbent wool about the size of a large walnut, also soaked in lysol solution. The plugging is continued until the vagina is as full as it will hold (*v.* Fig. 135). The patient is then put back to bed, and a tight abdominal binder

applied in order to increase the intra-uterine pressure by compressing the fundus, and to increase the force with which the vaginal plug is compressing the cervix by driving the uterus down into the pelvis. The wadding, which is used, should have been previously boiled for five or ten minutes. The plug is left in until strong labour pains ensue, and they usually occur in from three to four hours. In some

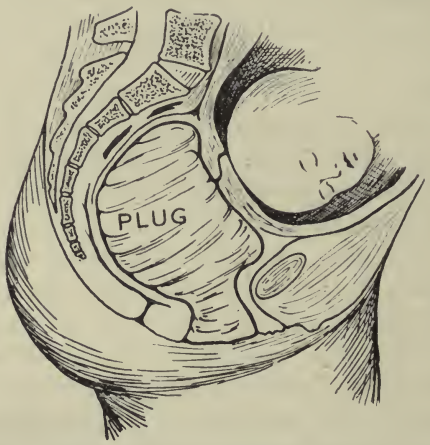


Fig. 135.—Diagram showing a vaginal tampon in position.

cases, the onset of labour may be slower than this, and then the plug must be removed after twelve hours, for fear of decomposition. If the hæmorrhage comes on again, the plugging must be repeated, but this is usually unnecessary. The success of this treatment depends upon three points :—

(1) The uterus must be "healthy."
(2) The ovum must be intact.
(3) The plug must be applied tightly.

If the patient is in strong labour at the time the hæmorrhage begins, it is not a difficult matter to check the latter. If the membranes are intact, rupture them. This enables the uterine contractions to continue without at the same time causing traction on the placenta, and so detaching more of it. Also, owing to the escape of the liquor amnii, the uterus is enabled to contract down upon the child, and thus to diminish the size of the placental site. If the hæmorrhage continues, the vagina may still be plugged, as the presence of uterine contractions ensures the obliteration of the space formerly occupied by the liquor amnii, and hence there will be no room for intra-uterine hæmorrhage; or, if the os is sufficiently dilated, the fœtus may be delivered by version followed by extraction, or, if the head is fixed, by the application of the forceps.

Other Modes of Treatment.—Other modes of treatment, which are recommended by various obstetricians, are as follows:—

(1) Rupture of the membranes in every case. This is good treatment if we can be certain that the uterus will subsequently contract down upon the child. But we cannot be certain of this, unless the patient is having strong labour pains. It must, therefore, be reserved for such cases.

(2) *Accouchement forcé.*—This is exceedingly bad treatment. If the patient has lost much blood, she is in danger of dying of cardiac failure, and any intra-uterine manipulations increase this tendency, particularly if they are followed by the forcible extraction of the child. The only point in favour of this treatment is that it gives a lower infantile

mortality. This point will be referred to again (*v.* page 387).

UNAVOIDABLE HÆMORRHAGE.

By the term unavoidable hæmorrhage is meant hæmorrhage due to the detachment of a placenta prævia, that is a placenta which is implanted so near the internal os that a portion of it is separated during the formation of the lower uterine segment (Winckel) (*v.* Fig. 136).

Frequency.—The same difficulty, which is met with in estimating the proportion of cases in which accidental hæmorrhage occurs, is also met with in estimating the proportion of placenta prævia, inasmuch as some writers include in their statistics cases which others reject. Estimating on the basis that only cases in which hæmorrhage started during or subsequent to the seventh month are to be included, in the Rotunda Hospital amongst 25,790 patients the relative frequency of unavoidable hæmorrhage was one in 213·14, *i. e.* 0·46 per cent.

Ætiology.—The ætiology of placenta prævia is very obscure. It is more frequent amongst multiparæ than amongst primiparæ, and is also relatively more frequent in the case of twin pregnancies. The many theories which have been brought forward may be reduced to two:—

(1) That the ovum is implanted at an abnormally low level in the uterus, and that, consequently, the placenta, when formed, lies nearer the os internum than is normal. Placenta prævia frequently occurs in patients with a history of previous attacks of

endometritis, and it has been suggested that the increased size of the uterine cavity in the latter condition allows the ovum, when it leaves the Fallopian tube, to drop into the lower part of the

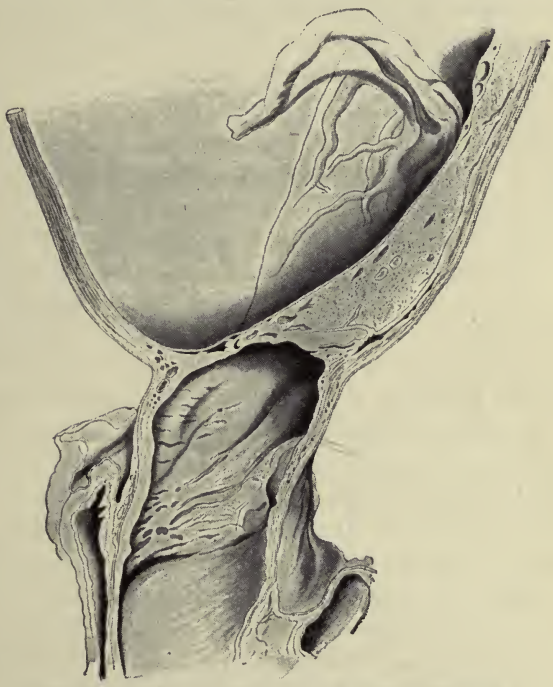


Fig. 136.—Marginal placenta prævia. (*Ahlfeld.*)

uterus. Webster suggests that the low implantation of the ovum may be due to its fertilisation rather later than is usually the case, *i. e.* after it has reached the lower part of the uterus. There is, so far as we know, no reason why fertilisation should not occur when the ovum is in the neighbourhood

of the lower uterine segment, but, if every such fertilisation resulted in the formation of a placenta prævia, this condition should be much more common than it is. This difficulty, however, can be met by the equally probable assumption that, when such late fertilisation occurs, the ovum is, as a rule, carried out of the uterus before it has time to become implanted in the mucous membrane, and that only in the rare cases in which the ovum is not carried out of the uterus does implantation in the lower segment result.

(2) That the placenta is developed out of chorionic villi which are implanted in the decidua reflexa as well as out of those which are implanted in the normal manner in the decidua serotina, or, in other words, that there is a reflexal placenta as well as a serotinal placenta. This theory has been verified by specimens showing a reflexal placenta, and probably accounts for most cases of placenta prævia.

Hæmorrhage from a placenta prævia may be started in one of several ways:—In the case of a reflexal placenta, it is probably due to degeneration and excessive thinning of the reflexal portion, due to the increase in size of the ovum. In such cases, the hæmorrhage usually commences during pregnancy, or, if the union between the reflexal placenta and the decidua vera is very dense, it may not occur until full term. In the case of a low implantation of the ovum, the placenta being entirely serotinal, hæmorrhage, as a rule, is started by the commencing dilatation of the cervix and the formation of the lower uterine segment, and so is coincident with the onset of labour. As a rule, in

such cases the hæmorrhage does not occur until full term, but sometimes it may occur earlier as a result of the onset of premature labour. Lastly, a placenta prævia may be detached in consequence of the action of causes similar to those which bring about the detachment of a normally seated placenta.

In some cases, hæmorrhage may be due to tearing of the so-called circular sinus (Meckel) of the placenta—that is, in the outer ring of intervillous spaces which surround the placenta. The "sinus" may be torn even in cases in which the placenta is normally seated, but it is naturally more exposed to injury during labour, when the edge of the placenta passes across the uterine orifice.

Varieties.—Three varieties of placenta prævia are described :—

(1) *Placenta prævia centralis ;* in which the placenta covers the entire undilated internal os.

(2) *Placenta prævia marginalis ;* in which the placenta comes down to the edge of the undilated internal os (*v.* Fig. 136).

(3) *Placenta prævia lateralis ;* in which a portion of the placenta lies in the lower uterine segment, but does not descend so far as the undilated internal os.

Symptoms.—The chief symptom is hæmorrhage, occurring any time after the commencement of the seventh month. If the hæmorrhage continues untreated, there will be the usual symptoms of collapse.

Diagnosis.—The diagnosis is made by a vaginal examination. If the placenta is felt through the os or through the lateral fornix, it is a case of placenta prævia. If the placenta cannot be felt, then it is either a case of accidental hæmorrhage or of

hæmorrhage due to a lateral placenta prævia; in either case, the treatment to be adopted is that of accidental hæmorrhage. In a favourable subject, the occurrence of placenta prævia may be diagnosed by abdominal palpation. The points to be looked for are :—the high situation of the presenting part, and an increased sense of resistance, and an increased difficulty in feeling the fœtal parts, over one part of the lower uterine segment.

Treatment.—As soon as the diagnosis of placenta prævia is made, the patient should be treated, because even though temporary cessation of the hæmorrhage may occur, its return is inevitable. As in accidental hæmorrhage, the treatment depends on whether the patient is, or is not, in labour. Usually, she is not in labour at the onset of the hæmorrhage, and in this case the prognosis is considerably more serious. Under these circumstances the best treatment is that recommended by Braxton Hicks. It consists in turning the fœtus by bipolar version into a breech presentation, rupturing the membranes, drawing down a foot (*v.* page 557), and leaving the rest of the delivery to nature. If it is a case of central placenta prævia, the fingers must be pushed directly upwards through the placenta in their attempt to seize the foot. This treatment both checks the hæmorrhage, by the pressure of the breech or back of the child against the placenta, and brings on labour. A piece of gauze should be tied to the foot; and, if further hæmorrhage occurs, light traction on the gauze will check it, by drawing down more of the breech. In order to carry out this treatment successfully, two conditions must be present :—

(1) The membranes must be unruptured.
(2) The os must be large enough to admit at least two fingers.

The first condition is practically always present, unless, indeed, an ignorant attendant has ruptured the membranes. The second condition is present in more than 99 per cent. of all cases of placenta prævia in which the patient is bleeding. In the rare instances in which it is not present, plug the vagina and leave the plug in for a few hours. The os will then be found sufficiently dilated to allow version to be performed.

If the patient is getting strong labour pains when the hæmorrhage commences, rupture of the membranes is often sufficient to check the bleeding. Rupture of the membranes acts in these cases, as it does in accidental hæmorrhage in the presence of strong labour pains; viz. it allows the head to advance without detaching more of the placenta, and the placenta to retract upwards with the lower uterine segment, and it diminishes the size of the placental site (*v.* page 379). If the hæmorrhage still continues, the child may be delivered by the forceps, if the head is fixed, and the os dilated. If these conditions are not present, the child may be turned by internal version, and the rest of the delivery left to nature.

Other Modes of Treatment.—Other modes of treatment, recommended by various obstetricians, are as follows:—

(1) Champetier de Ribes' dilator. This method consists in introducing Champetier de Ribes' hydrostatic dilator (*v.* Fig. 175) into the amniotic cavity,

after rupture of the membranes. The bag is then distended with water, and acts in the same manner as does the breech in Braxton Hicks' method. The advantages claimed for this method are the ease with which it is carried out, and the improved fœtal prognosis. Its disadvantages appear to be, first, that in careless hands sepsis is more likely to be caused than by Braxton Hicks' method, inasmuch as a foreign body—possibly non-sterile—lies in the uterus for some hours, and, secondly, that it requires a special apparatus, and, moreover, one which is extremely liable to be damaged by keeping, and hence to be useless when required.

(2) *Accouchement forcé.*—The same objection applies to the adoption of this treatment in the case of placenta prævia, as does to its adoption in accidental hæmorrhage (*v.* page 379).

(3) Plugging the vagina. There is a considerable risk of sepsis in any case of plugging, more particularly in placenta prævia, owing to the low situation of the placenta. It should not be performed, therefore, unless it is absolutely necessary.

(4) Partial detachment of the placenta—Barnes' method. This consists in separating all the placenta which adheres to the lower uterine segment. It is performed by "insinuating a finger between the placenta and the uterine wall, and then sweeping the finger round in a circle, so as to separate the placenta as far as the finger can reach." In doing this the patient runs a greater risk of sepsis than if version is adopted, as the fingers of necessity come into very close contact with the uterine sinuses, and bacteria may be introduced if the strictest asepsis is

not adopted. Barnes considered that this procedure, by accelerating the necessary process of separation of the placenta from the lower uterine segment, and by removing an obstacle to the dilatation of the cervix, shortened the time during which hæmorrhage occurred.

Complications.—Patients suffering from placenta prævia are more liable to post-partum hæmorrhage and to sepsis than are others. The former frequently occurs owing to the fact that the lower uterine segment does not contract as firmly as the fundus, and that, consequently, the uterine sinuses may be only partially obliterated. Furthermore, if rapid dilatation of the cervix and extraction are the treatment adopted, deep lacerations of the cervix are almost certain to occur. The cervix and the lower uterine segment tear very much more easily in cases of placenta prævia than in cases of normal insertion of the placenta. It thus frequently happens that, while we think the os is dilating under the pressure of our fingers, it is really tearing. Again, a laceration of the cervix which would be trivial in the case of a normally situated placenta, may cause grave trouble in placenta prævia, owing to the large vessels in the neighbourhood of the cervix which supply the placenta. There is also more risk of sepsis in these cases, as the placental site lies so near the vagina, that, if any infection of the latter occurs, the former is almost certain to become infected also.

Fœtal Mortality.—It is well said that, in any case of ante-partum hæmorrhage, the life of the child must be considered as antagonistic to the life of the mother. Any treatment which yields the smallest

fœtal mortality will give the largest maternal mortality, and *vice versâ*. Thus, in both accidental and unavoidable hæmorrhage, *accouchement forcé* will save the greatest number of children; but it will lose from six to twelve times as many mothers as will the treatment by plugging in accidental hæmorrhage, or by bi-polar version in placenta prævia. Even if the child is brought into the world alive in either of these conditions, it is most frequently premature, and weak from its previous semi-asphyxia. As a result, it most frequently dies within the first month. Under these circumstances, the life of the mother should not be risked by adopting a treatment which is avowedly more dangerous for her, merely because it affords a slightly improved chance of saving the child.

CHAPTER XXII.

PRECIPITATE LABOUR—UTERINE INERTIA—RETAINED PLACENTA.

Precipitate Labour—Uterine Inertia: Varieties—Primary Uterine Inertia—Secondary Uterine Inertia—Retained Placenta.

PRECIPITATE LABOUR.

Precipitate labour occurs when the contractions of the uterus are considerably stronger than are necessary to overcome the resistance of the soft parts of the mother. As a result, the child is driven rapidly through the pelvis, and is born when, perhaps, the mother is not in a suitable position. In consequence of this, the umbilical cord may be torn, the placenta may be detached prematurely, the uterus may be inverted, or the death of the child may result. Perinæal laceration may also occur.

Treatment.—If we know that a patient is subject to precipitate labour, she should be placed in bed immediately labour commences, and should not be allowed to leave it. She should refrain from bearing down, and with this object it is usually well to administer chloroform. By these means accidents will be prevented.

UTERINE INERTIA.

The term uterine inertia means that the contractions of the uterus are feeble, so that they either fail to expel the child, or only succeed after a long time.

Varieties.—Uterine inertia occurs in two distinct forms :—

(A) Primary inertia.
(B) Secondary inertia.

These are so distinct one from the other that they must be considered separately.

(A) **Primary Uterine Inertia.**—In this condition, the contractions of the uterus are, from the very commencement of labour, more feeble than normal. The uterus never contracts strongly.

Ætiology.—The causes of primary uterine inertia usually lie in the uterus itself, or in its contents. They are :—

(1) Weak muscular development.
(2) Faulty shape, as uterus bicornis.
(3) Myo-metritis.
(4) Over-distension, as by hydramnios or twins.
(5) Tumours, as myomata.
(6) Generally contracted pelvis.
(7) Frequent labours.

More rarely uterine inertia is due to wasting diseases, mal-nutrition, and such like conditions, in which the mother is in a very debilitated state.

Symptoms.—The os dilates slowly ; there is only slight distension of the bag of membranes during a pain ; no caput succedaneum forms upon the child's head ; and the hardening of the uterus during a pain

is almost imperceptible. If the head lies in the pelvis for too long a time, the patient becomes feverish and restless, and in rare cases sloughing of the vaginal walls or cervix may occur. The third stage is usually characterised by the slow expulsion of the placenta, or by its non-expulsion, and probably by the occurrence of atonic post-partum hæmorrhage.

Treatment.—In primary uterine inertia, the uterus is obviously not sufficiently strong to expel the child, and the indication is to stimulate and assist it. This may be done by massage of its walls, stimulating food, hot vaginal douches, followed by the expression of the fœtus if possible (Kristeller's method). If such treatment is not successful, the forceps must be applied as soon as the necessary conditions are fulfilled (*v.* page 544). If the contractions have not been sufficiently strong to dilate the cervix, it may be dilated with Frommer's dilator. If the head does not become fixed in the brim, delivery may be effected by version and extraction. In all cases in which artificial delivery becomes necessary, we should be prepared for the occurrence of post-partum hæmorrhage, and have everything ready for its treatment.

(B) **Secondary Uterine Inertia.**—In this condition the contractions of the uterus may have been of normal intensity, or even too strong, at the commencement of labour, but gradually diminish in strength as labour proceeds.

Ætiology.—A less degree of the same pathological conditions of the uterus that caused primary inertia, may also cause secondary inertia. To these conditions may be added the following :—

(1) Distension of the bladder or rectum.
(2) Large fœtal head.
(3) Pendulous abdomen.
(4) Weakness or collapse of the patient.
(5) Rigid soft parts.
(6) Any form of contracted pelvis.

Symptoms.—The patient will have been for some time in normal, or perhaps in excessively strong labour, then the contractions gradually become more feeble, and, if the condition persists, the train of symptoms, as mentioned under primary inertia, supervenes.

Treatment.—If any obstruction is present, such as a full bladder or rectum, remove it. Correct any obliquity of the uterus by applying an abdominal binder. Give the patient an opiate, as—Tinct. Opii 20 to 30 minims; this will cause her to sleep, and when she awakes, she will be refreshed, and the pains may return. If she still fails to deliver herself, the forceps must be applied.

RETAINED PLACENTA.

As has been already said, if the uterus fails to expel the placenta, it must be made to do so. It may expel the placenta immediately after the birth of the child, or it may not expel the placenta for an hour. If the uterus has not expelled the placenta spontaneously within this period, steps must be taken to expel it artificially.

Frequency.—In the Rotunda Hospital, amongst 25,790 patients, the relative frequency of manual removal of the placenta was 1 in 196·87, *i.e.* 0·5 per cent

Ætiology.—There are four chief causes of retained placenta :—

(1) Uterine inertia.
(2) Morbid adhesions between the placenta and the uterus.
(3) A *placenta membranacea.*
(4) Hour-glass contraction of the uterus.

(1) In uterine inertia, the placenta is retained in the uterus owing to the failure of the force which normally expels it.

(2) Morbid adhesions between the placenta and the uterus are the result of decidual endometritis; they may be so dense that it is almost impossible to detach the placenta.

(3) A *placenta membranacea* is the term applied to a large, membrane-like placenta. When the uterus contracts, it crumples up such a placenta in its interior instead of completely detaching it.

(4) Hour-glass contraction is a very rare condition. The uterus contracts circularly below the placenta, while the fundus remains uncontracted. It is practically always due to bad management of the third stage. The attendant massages the region of the retraction ring instead of the fundus, and so causes the former to contract and prevent the passage of the placenta.

Treatment.—If the retention is due to hour-glass contraction, cease massaging the uterus; the contraction will then probably pass off, and the placenta will be expelled. If it is not expelled, and if expression fails, or if there is hæmorrhage and we cannot wait, introduce the fingers into the uterus in the shape of a cone, push them gently and slowly

through the obstruction, and remove the placenta. Care must be taken to do this slowly and without undue force, or the uterus may be ruptured.

In retention of the placenta, due to other causes, massage the fundus, and attempt to express the pla-

FIG. 137.—Manual removal of an adherent placenta. (*Norris.*) (The position of the hands is the reverse of that which has been recommended in the text, *i. e.* the left hand is shown in the act of detaching the placenta.)

centa by the Dublin method (*v.* page 204). If this fails, the placenta must be removed manually. This operation, which used to be considered one of the most dangerous in midwifery, owing to the risk of sepsis, is now performed with comparative safety if strict aseptic precautions are used. It is performed

as follows:—Place the patient in the cross-bed position, thoroughly wash her external genitals, and empty the bladder. Always wear rubber gloves. Introduce the hand into the uterus, taking care to keep outside the membranes, and at the same time applying counter-pressure with the other hand upon the fundus. Feel for the edge of the placenta, and with the tips of the fingers separate it from the uterus with a sawing motion (*v.* Fig. 137). Endeavour to detach it all in one piece. When it is completely detached, seize it in the hand passed above it, and remove it. Introduce the hand again into the uterus to ascertain if any portions have been left behind. As soon as all the fragments have been removed, douch the uterus thoroughly, and put the patient back to bed. Avoid, if possible, giving an anæsthetic in these cases, as it may interfere with the subsequent contractions of the uterus. If it must be given, let the patient be fully under its influence before the hand is introduced into the uterus, as this latter proceeding sometimes causes a considerable amount of shock to the patient; and, when this shock occurs at a time when she is commencing to come under the influence of an anæsthetic, the tendency to cardiac syncope is very great.

CHAPTER XXIII.

CONTRACTED PELVIS.

Diameters of the Normal Pelvis—Varieties of Contracted Pelvis—The Common Forms of Contracted Pelvis—The Remaining Forms of Contracted Pelvis — Diagnosis — Mechanism of Generally Contracted Pelvis—Mechanism of Flat Pelvis—Mechanism of Generally Contracted Flat Pelvis—Treatment—Table of Degrees of Contraction—Walcher's Position—Time at which to induce Premature Labour—Müller's Method.

The pelvis is said to be contracted if any of its diameters is shorter than is normal. The normal diameters of the pelvic brim measure :—

True conjugate .	4—4¼ inches	(10—10·5 cm.).
Oblique diameters (2) .	5 „	(12·5 „).
Transverse diameter .	5¼ „	(13·8 „).

The diameters of the pelvic outlet measure :—

Antero-posterior diameter .	3⅘ inches	(9·5 cm.).
Transverse „ .	4⅖ „	(11 „).

Varieties—The different varieties of contracted pelvis can be classified as follows :—

I. Generally contracted pelvis.

(1) Generally contracted pelvis, *pelvis æquabiliter justo-minor.*

(A) Non-rachitic.

(B) Rachitic.

(2) Dwarf pelvis.

II. Flattened pelvis.
    (1) Flat pelvis.
        (A) Non-rachitic.
        (B) Rachitic.
    (2) Generally contracted, flat pelvis.
        (A) Non-rachitic
        (B) Rachitic.
    (3) Pelvis of congenital dislocation of the hips.
III. Obliquely distorted pelvis.
    (1) By spinal curvature — kypho-scoliotic pelvis.
    (2) By imperfect or abolished use of one lower limb—coxalgic pelvis.
    (3) By asymmetry of sacrum — unilateral synostotic pelvis (Naegele's pelvis).
IV. Transversely contracted pelvis.
    (1) The bilateral synostotic pelvis (Robert's pelvis).
    (2) The kyphotic pelvis.
V. Funnel-shaped pelvis.
VI. Compressed or triradiate pelvis.
    (1) The rachitic triradiate pelvis.
    (2) The osteomalacic triradiate pelvis.
VII. Spondylolisthetic pelvis.
VIII. Pelvis narrowed by tumours, exostoses, fractures.
IX. Split pelvis.

The Common Forms of Contracted Pelvis.

The varieties of contracted pelvis which are most commonly met with in these countries, are included

in Groups I and II in the foregoing classification, and are as follows:—

I. (1) (A) The generally contracted, non-rachitic pelvis.

II. (1) The flat pelvis, both rachitic and non-rachitic.

(2) (B) The generally contracted flat rachitic pelvis.

In discussing these varieties it is convenient to discuss also the rachitic generally contracted pelvis, the dwarf pelvis, the non-rachitic generally contracted flat pelvis, and the pelvis of congenital dislocation of the hips, as, both anatomically and in their effect upon labour, they resemble very closely the more common varieties. We shall, therefore, under the present heading discuss all the varieties included in Classes I and II.

I. **The Generally Contracted Pelvis.**—The principal characteristic of this group consists in the proportionate shortening of all the diameters of the pelvis. Its varieties are as follows:—

(1) The generally contracted pelvis (*pelvis æquabiliter justo-minor*).

(A) Non-rachitic.

(B) Rachitic.

(2) The dwarf pelvis.

(1) *The Generally Contracted Pelvis* (*pelvis æquabiliter justo-minor*).—The rachitic and the non-rachitic forms of this variety of pelvis so closely resemble one another that it is impossible to distinguish between them, unless the history of the patient or the presence of lesions in other parts of the body

furnish evidence of rickets. Consequently, both varieties may be discussed together.

The generally contracted pelvis is most commonly found in women below the average size. It has also been occasionally observed in women of normal or even of large size, especially in those whose general form approaches the masculine type. It

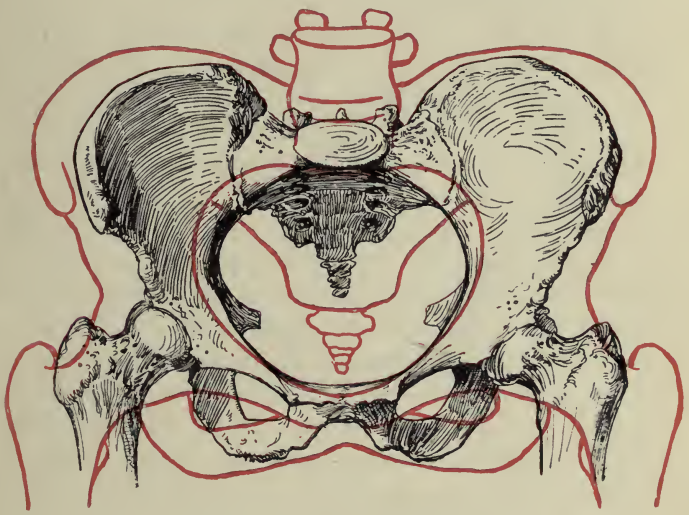


FIG. 138.—Generally contracted non-rachitic pelvis.[1] (Normal outline in red.)

presents the appearance of a normal female pelvis, in which all the diameters are diminished in length. This diminution is usually so proportioned that the diameters retain their normal relation to one another.

[1] This and the other drawings of contracted pelvis are taken from the Author's 'Manual of Midwifery,' for which book they were specially made from the collection of the late Professor Milne Murray, of Edinburgh.

Sometimes the shortening is more marked in one diameter than in another, most frequently in the conjugata vera, and produces in such a case a condition which approximates to the generally contracted flat pelvis, and which is usually the result of mild rickets (rachitic variety). Further evidence of this disease may possibly be found in extreme prominence of the ilio-pectineal lines.

The cause of contraction in non-rachitic cases is unknown, but the deformity has been ascribed to the carrying of heavy weights in childhood, thus throwing an excessive strain upon the pelvis, or to such general diseases as anæmia, which may produce a universal arrest of development.

The Dwarf Pelvis.—The dwarf pelvis, or *pelvis nana,* is most often the result of a severe type of rickets, or some similar disease of the bones, occurring either in fœtal or in early extra-uterine life, and causing a general cessation of development of the body. It occurs in true dwarfs, in whom a cause for their small size cannot be detected. The bones are slight and often remain united by cartilage, and the contraction, as a rule, is extreme throughout the whole canal.

II. **Flattened Pelvis.**—This is the most common class of contracted pelvis met with. The principal feature is the shortening of the antero-posterior diameter of the brim, while the other diameters remain normal, or are slightly affected.

The varieties of flattened pelvis are as follows :—

(1) Flat pelvis.
   (A) Non-rachitic.
   (B) Rachitic.

(2) Generally contracted flat pelvis.
  (A) Non-rachitic.
  (B) Rachitic.
(3) Pelvis of congenital dislocation of the hips.

(1) *The Flat Pelvis.*—The essential feature of

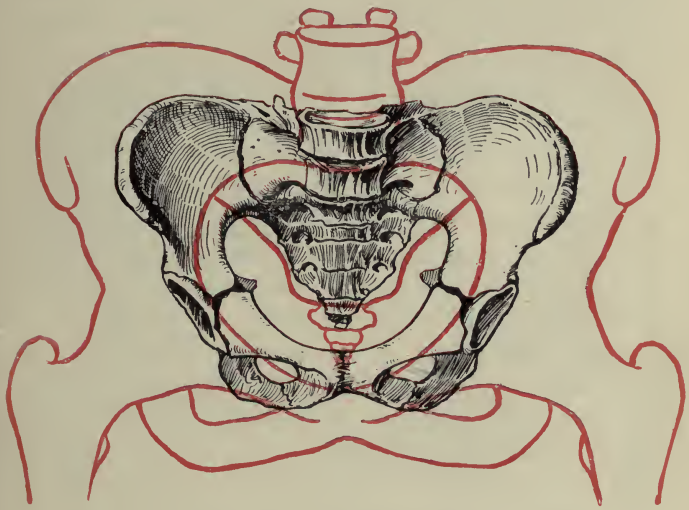


FIG. 139.—The dwarf pelvis.

both the non-rachitic and the rachitic varieties of flat pelvis is a diminution in the length of the true conjugate, unaccompanied by any diminution in the other diameters.

The flattened non-rachitic or simple flat pelvis is, except in minor degrees, only rarely met with. It is generally believed to be produced by very severe work, involving much standing and the carrying of heavy

weights during childhood, when the bones are in a plastic condition. It is also probable that some abnormal laxity or weakness of the posterior sacro-iliac ligaments is present, and permits of displacement of the sacrum. Such a relaxation may take place at the period of puberty, as a result of anæmia and general debility, which in their severe forms lead to the lateral curvature of the spine so common at this age.

In this pelvis the sacrum is normal in shape, but it is displaced bodily downwards and forwards into the pelvis, and thus produces an antero-posterior contraction, which is slightly more marked at the inlet. In comparison with the conjugate, the transverse and oblique diameters are relatively lengthened. Sometimes the transverse diameter is actually lengthened, but in the majority of cases it is slightly shortened. The whole pelvis, indeed, is often small. As a result of the sacral displacement, the posterior superior iliac spines approach more closely than normal to the middle line behind the sacrum, and thus constitute an important aid to the diagnosis of the condition.

The changes found in the rachitic variety of flattened pelvis are, for the most part, the direct results of the pressure of the body-weight acting downwards through the sacrum, and of the counter-pressure acting upwards and inwards through the heads of the femora, upon bones which have become softened and atrophic from rickets. The amount of flattening and general deformity produced depends upon the duration and severity of the rickets. In infants, the body-weight is responsible for the

greater part of the deformity, since the disease usually sets in before walking or standing is attempted, and having once set in, prevents both walking and standing. For this reason there is but little counter-pressure against the acetabula.

The sacrum is sunk deeply between the iliac

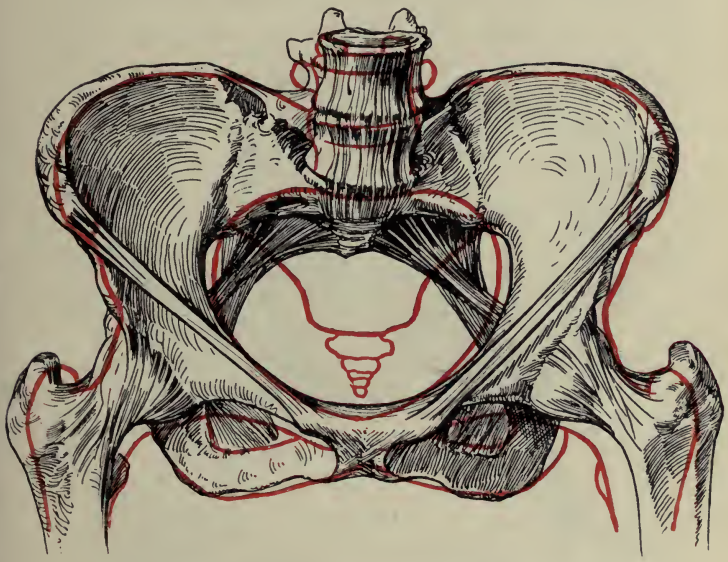


Fig. 140.—The rachitic flat pelvis. Minor degree.

bones, being displaced forwards and downwards by the body-weight, and is at the same time rotated forwards on its transverse axis, so that the sacral promontory projects causing great shortening of the conjugata vera, and often giving the inlet a reniform outline. The general rotation of the sacrum prevents the lower part from causing an obstruction

at the outlet. The normal transverse curvature is absent, and the front of the bone is flat, or even slightly convex from side to side. The transverse diameter of the brim is increased relatively to the conjugate, but, in many pelves, though relatively increased, it is actually diminished, as a result of

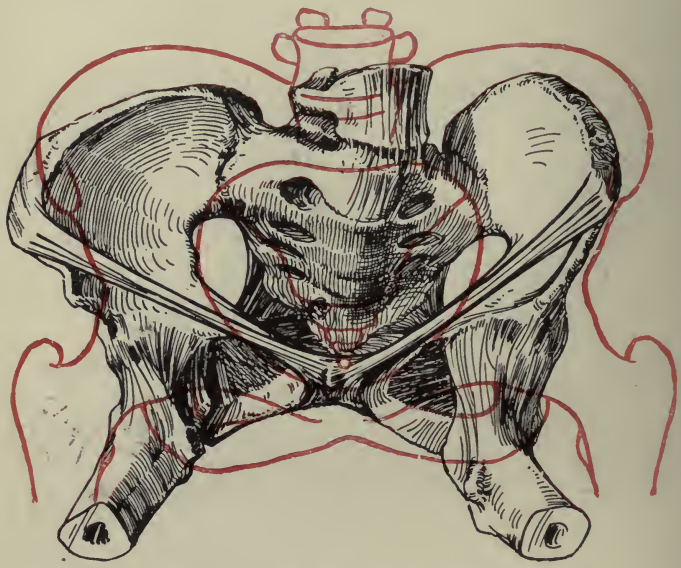


Fig. 141.—The rachitic flat pelvis. Extreme degree.

the general mal-development produced by the rickets. The pubic arch also is greatly widened. The conjugate diameter, which is much shortened at the inlet, is considerably increased in length below the brim, on account of the curvature and position of the sacrum. At the outlet it again undergoes some diminution, but not to any marked extent, and this diameter

may be even longer than in the normal pelvis. The tubera ischii are widely separated, and the transverse diameter is, therefore, widened at the outlet.

The general result of these changes is to produce a pelvis flattened at the brim, and increasing in capacity from above downwards in both the conjugate and transverse directions. In the false pelvis the iliac fossæ are flatter and more vertical than normal, and look almost directly forwards. The curvature of the iliac crests is diminished, and the anterior superior iliac spines are directed rather outwards than forwards, so that the distance between them is as great, or even greater, than between any other corresponding points on the crests. In consequence of the position of the sacrum the posterior iliac spines approach one another closely.

(2) *The Generally Contracted Flat Pelvis.*—The essential feature of the generally contracted flat pelvis is contraction of all the diameters of the brim, especially marked in the true conjugate, which is diminished out of proportion to the other diameters.

The non-rachitic generally contracted flat pelvis is rarer than the rachitic form. It resembles a justo-minor pelvis in which the sacrum has sunk into the pelvic cavity, with consequent diminution of the conjugate diameter out of proportion to the other diameters. It is probably the result of causes similar to those which produce a justo-minor pelvis, and can be distinguished from the rachitic variety by the absence of deformity of the sacrum.

The rachitic generally contracted flat pelvis is comparatively common, but does not require any lengthy description, because it is almost identical in

appearance with the flat rachitic pelvis, except that there is more general contraction. It is the result of rickets of a more severe type than that which leads to the flat rachitic pelvis, and which is responsible not only for the flattening, but also for the pronounced arrest of development of the bones. The sacrum is deformed and displaced, and the

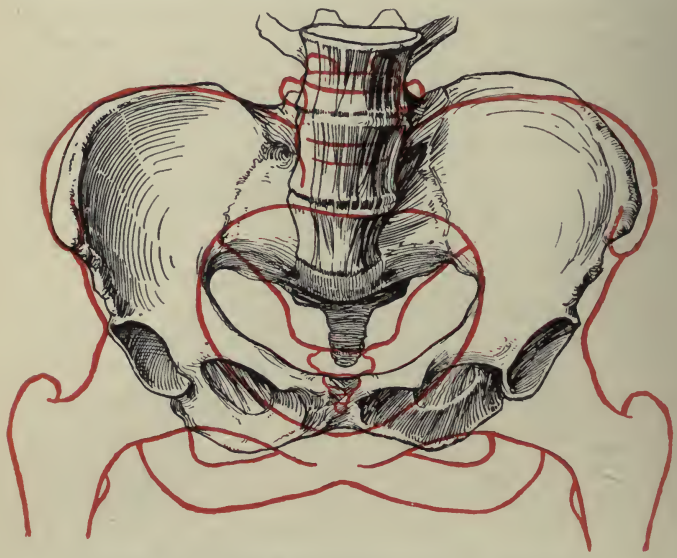


Fig. 142.—The rachitic generally contracted flat pelvis.

bones are characteristically rickety. It is, as would be expected, most commonly found in small women.

(3) *The Pelvis of Congenital Dislocation of the Hips.*—The form of pelvis, met with in the condition which is usually termed double congenital dislocation of the hips, is one which, from a developmental point of view, is of extreme interest, although it gives rise

to only slight difficulty during labour. It is a rare form of pelvic contraction.

In cases of congenital dislocation of the hips, the heads of the femora most commonly articulate with the dorsum ilii above and behind the region of the acetabula, and at the same time are placed farther apart than is normal. The promontory of the

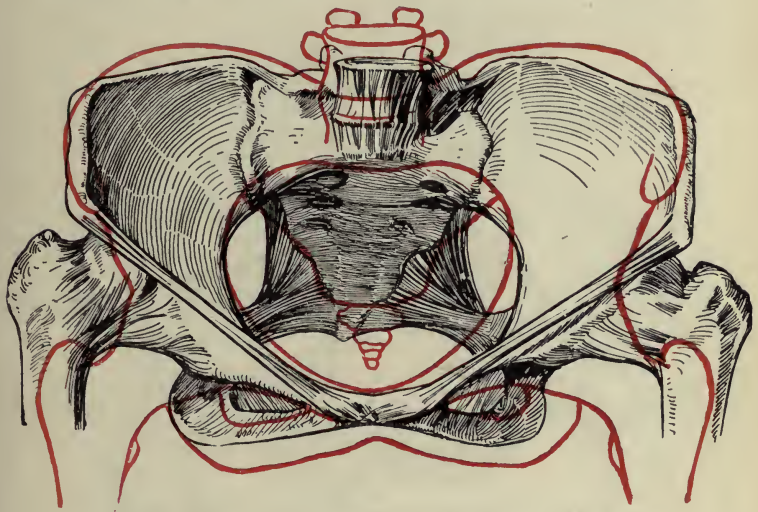


Fig. 143.—The pelvis of congenital dislocation of the hips.

sacrum is depressed, and consequently there is a moderate degree of flattening at the brim. The vertical curvature of the sacrum is somewhat increased, and the coccyx projects downwards into the pelvis, but since it is at the same time rotated upwards, the conjugate diameter of the outlet is not diminished in length, and even may be increased.

There is a slight increase of the transverse diameter at the inlet. The transverse diameter of

the outlet is also widened, but in a more marked degree, the tubera ischii being pulled forwards and outwards by the muscles attached to them, while at the same time the sub-pubic angle is enlarged.

The Remaining Forms of Contracted Pelvis.

The remaining forms of contracted pelvis are very rarely met with in these countries.

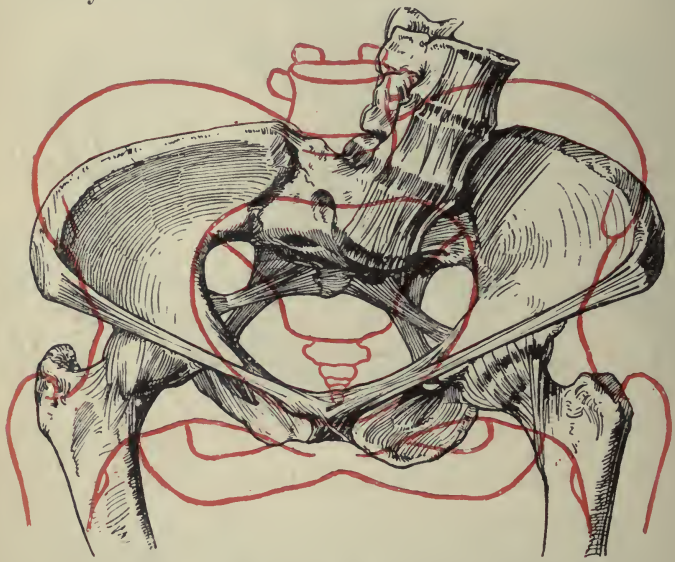


Fig. 144.—The kypho-scoliotic obliquely distorted pelvis.

III. **Obliquely Distorted Pelvis.**—Oblique distortion of the pelvis consists in the deviation of a part or the whole of the pelvis, towards one or other side, in such a manner that a marked difference results in the respective lengths of the oblique diameters. This distortion may be due to :—

(1) *Spinal curvature.—The kypho-scoliotic pelvis.* —The commonest cause of this form of pelvis is rachitic scoliosis, involving the lumbar region. The sacrum deviates, and the pelvis is also distorted to the opposite side to that to which the lumbar vertebræ are deflected. The oblique diameter on

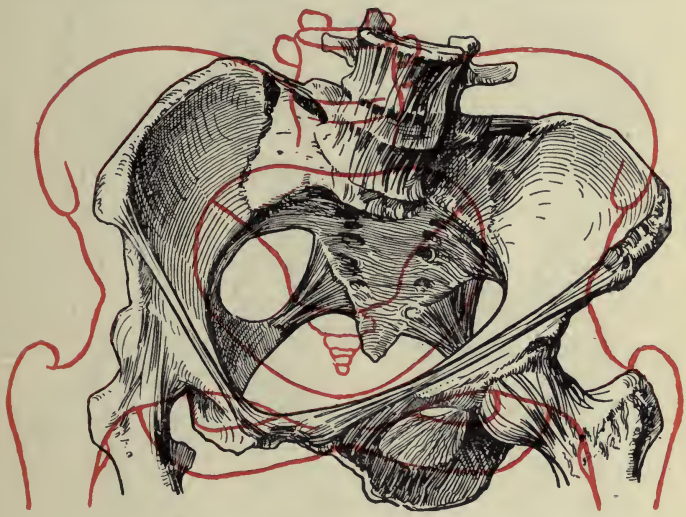


Fig. 145.—The coxalgic obliquely distorted pelvis.

the same side as the lumbar deflection is longer than its fellow (Fig. 144).

(2) *Imperfect or abolished use of one limb.—The coxalgic pelvis.*—The usual causes of this form of pelvis are unilateral coxalgia, amputation or old dislocation of one lower limb, or comminuted fracture of one ilium. The healthy side of the pelvis is narrowed and flattened, the diseased side dilated and hollowed out. This oblique narrowing may

extend to the outlet (Winckel). The pelvis is distorted towards the affected side, and the oblique diameter of the opposite side is the longer (Fig. 145).

(3) *Asymmetry of the sacrum.—Naegele's pelvis.*—This condition may be caused by unilateral disease,

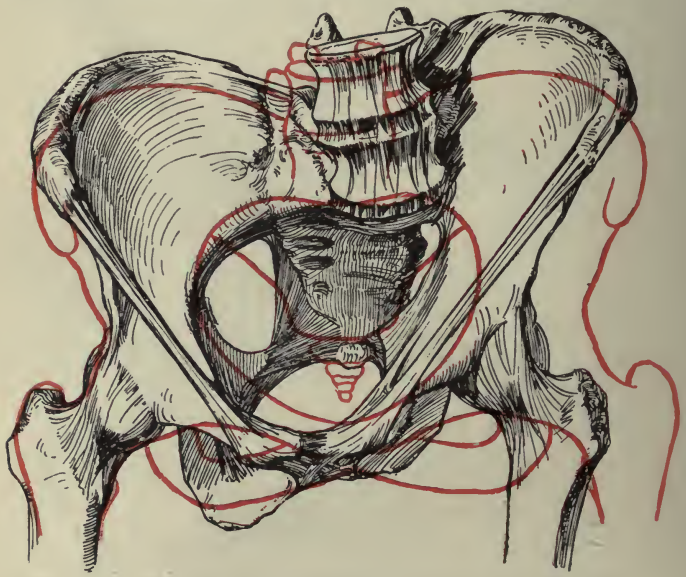


Fig. 146.—The unilateral synostotic obliquely distorted pelvis. Naegele's pelvis.

fracture, or failure of development, in the region of either sacro-iliac joint. The pelvis is distorted towards the healthy side. The oblique diameter of the same side as the lesion is the longer (Fig. 146).

These three forms of oblique pelvis all differ more or less from one another, but in all three the following defects can be noticed :—

(1) One oblique diameter is shorter than the other.

(2) The conjugate diameter deviates from the sagittal plane.

(3) The ala of the sacrum on the side of greater pressure is imperfectly developed, and the curvature of the os innominatum on the same side is diminished, while the curvature of the other os innominatum is increased.

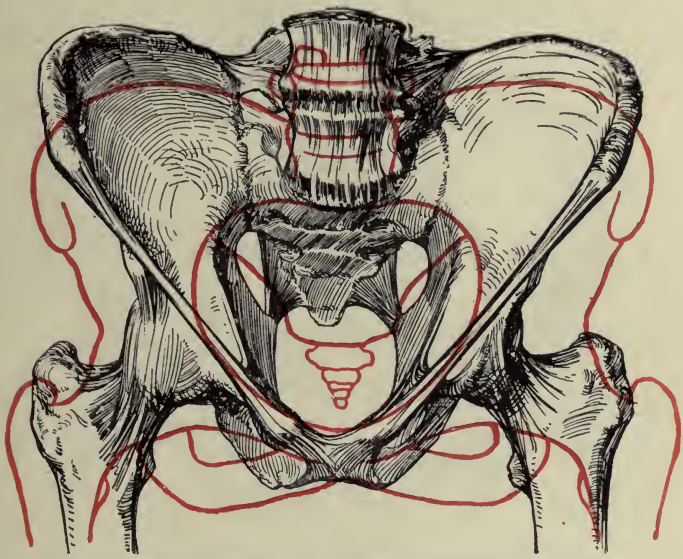


Fig. 147.—The bilateral synostotic transversely contracted pelvis. Robert's pelvis.

(4) The pelvic cavity is divisible into a narrow part, towards which the sacral promontory is directed, and into a wide part, bounded in front by the symphysis pubis.

IV. **Transversely Contracted Pelvis.**—A transversely contracted pelvis is one in which, as the name shows,

the transverse diameters are narrowed, while at the same time there is usually some compensatory elongation of the antero-posterior diameters. Two forms of this variety of pelvis are met with :—

(1) The bilateral synostotic or Robert's pelvis.

(2) The kyphotic pelvis.

Fig. 148.—The kyphotic transversely contracted pelvis.

(1) *Robert's pelvis.*—Robert's pelvis consists in symmetrical narrowing of the pelvis with compensatory antero-posterior elongation. The condition is caused by synostosis of both sacro-iliac joints, with practical absence of the sacral alæ (Fig. 147).

(2) *The kyphotic pelvis.*—The kyphotic pelvis is sometimes classified as a funnel-shaped pelvis. As

however, the transverse narrowing is well marked, and as the term "funnel-shaped pelvis" is usually applied to a special form of pelvis unconnected with any spinal lesion, we prefer to include the kyphotic pelvis in the present group. If the kyphosis is situated in the dorso-lumbar region of the spine,

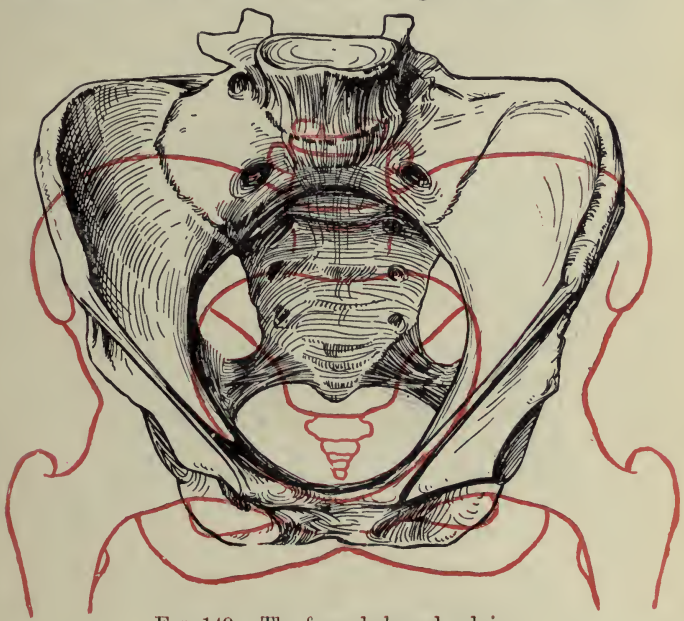


Fig. 149.—The funnel-shaped pelvis.

transverse contraction (Fig. 148) of the pelvis is the chief characteristic; if it is situated in the lumbo-sacral region, the funnel shape of the pelvis is more marked. As a result of the kyphosis the promontory of the sacrum moves backwards, while the tip moves forwards. The result of this is an increase in the true conjugate, and a decrease in the transverse

diameters of the brim, and in all the diameters of the outlet.

V. **Funnel-shaped Pelvis.**—By a funnel-shaped pelvis is meant a pelvis, not associated with any change in the spinal column, whose internal diameters diminish from the inlet to the outlet (Herman) (*v.* Fig. 149). It is an extremely rare condition, and its ætiology is unknown.

VI. **Compressed Pelvis.**—Two varieties of compressed triradiate pelvis are met with :—

(1) The osteo-malacic triradiate pelvis.

(2) The rachitic triradiate pelvis.

(1) *The osteo-malacic triradiate pelvis.* — This pelvis is the result of a disease of the bones which is excessively rare in this country, but which is found with considerable frequency in certain parts of Europe, and is known as osteo-malacia. This disease appears to be in some way definitely related to pregnancy. Indeed, it most often appears first during the period of gestation, and lasts till the puerperium, when, if the patient does not suckle her infant, slight recovery may set in till the onset of the next pregnancy, at the commencement of which there is again, as a rule, a marked increase in the disease.

The essential pathological factor met with in the disease is a chronic rarefying myelitis and osteitis, which cause a gradual absorption of the bony trabeculæ in the cancellous parts. The trabeculæ are at first replaced by a form of osteoid tissue devoid of calcium salts, but, later, they become infiltrated with a vascular granulation tissue chiefly

composed of small round cells, and completely disappear, so that on cutting into the bone it appears to be entirely composed of a semi-solid and reddish pulp. The medullary canals of the long bones become enlarged, and the compact tissue is also in great part absorbed, the process of absorption commencing around the vessels in the Haversian canals

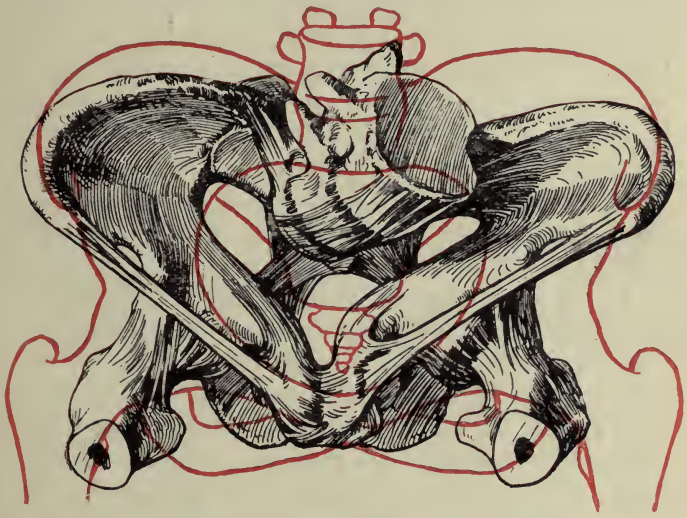


Fig. 150.—The osteo-malacic triradiate pelvis.

and gradually extending. In advanced cases, the bones become quite flexible, and can readily be indented by slight pressure. Sometimes, the bones are universally attacked, but, in pregnant women, the disease is often most marked in the pelvis and the vertebral column. The changes which take place in the shape of the pelvis are the result of the pressure and counter-pressure of the body-weight,

both in sitting and standing, acting upon abnormally softened bones, and to these forces must be added the influence of muscular contraction.

The first changes to appear are due to the pressure of the heads of the femora, which, as the bone softens, tends to drive the acetabular region upwards, backwards, and inwards. Ultimately, the two acetabula may come so close as to almost touch one another, only a narrow crevice being left between them. This leads anteriorly into a slit-like recess, bounded in front by the symphysis and on each side by the bodies of the pubic bones, which have become so sharply bent at the symphysis as to be parallel with one another and almost to lie in the sagittal plane. They thus form a marked rostrum or beak at the front of the pelvis.

At the same time, the pressure upon the base of the sacrum has gradually driven this bone downwards and forwards towards the centre of the pelvis, and at the same time has bent the bone upon itself, so that its vertical curvature is increased and the promontory forms a very marked projection at the inlet. This projection, together with the projection formed by the backs of the displaced acetabula, give to the inlet the characteristic triradiate appearance.

The outlet of the pelvis is also transversely contracted by the inward movement of the bodies of the ischia, and the effects of sitting and lying greatly increase this contraction, so that the tubera ischii often come in contact with one another.

(2) *The rachitic triradiate pelvis.*—This pelvis very closely resembles the osteo-malacic pelvis, and is the result of very similar conditions. It is caused

by a severe attack of rickets occurring at some period after the child has commenced to walk, and when the pressure of the femora is enabled to exert its full influence in producing distortion. The more advanced degrees of deformity are produced, as in true osteo-malacia, by pressure upon the outlet

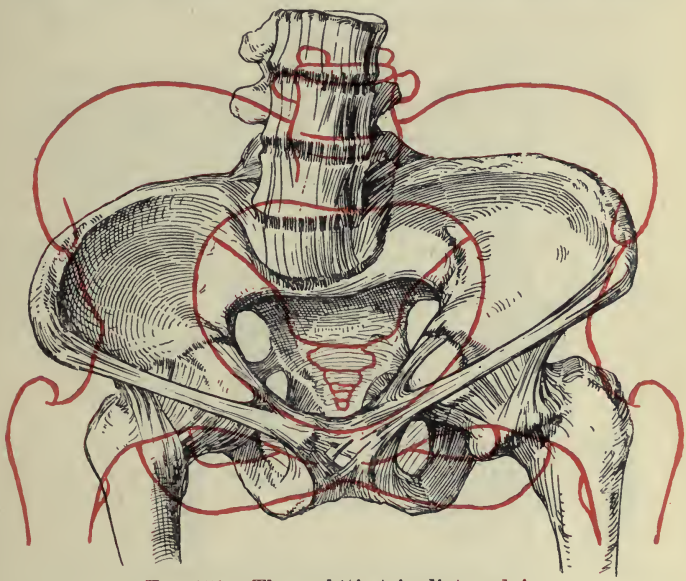


Fig. 151.—The rachitic triradiate pelvis.

during the later stages of the disease, when confinement to bed becomes necessary. As recovery from the rickets takes place, the bones rapidly harden and render permanent the triradiate appearance.

VII. **Spondylolisthetic Pelvis.**—The spondylolisthetic pelvis (*σπόνδυλος*, a vertebra, and *ὀλίσθησις*, a slipping) is due to the displacement of the fifth

lumbar vertebra forwards and downwards, so that its inferior surface is in contact with the anterior surface of the first sacral vertebra, to which it becomes synostosed. At the same time the arch of the lumbar vertebra remains in its old position, held by its inferior processes. The condition is due to

Fig. 152.—The spondylolisthetic pelvis.

the slipping forwards of the lumbar vertebra when the bony parts are still soft enough to allow the lateral interarticular processes to stretch, and may be caused by inflammatory conditions or direct injury (Fig. 152).

VIII. **Pelvis Narrowed by Tumours, Exostoses, Fractures.**—Narrowing of the pelvis may be caused by

osteomata, enchondromata, fibromata, sarcomata, carcinomata; by exostoses the result of inflammatory changes; and by fracture and dislocation (*v.* Fig. 153).

IX. **The Split Pelvis.**—A fissured or ununited pelvis is the result of the non-union of the pubic bones at the symphysis. It is usually associated with *ectopia vesicæ.*

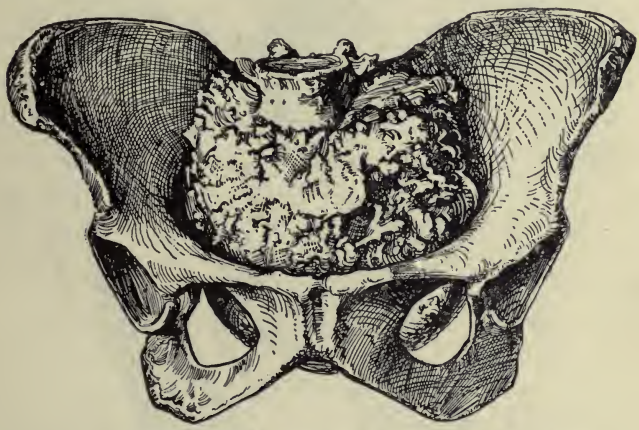


Fig. 153.—Pelvis narrowed by osseous tumour springing from the sacrum.

Diagnosis.—The diagnosis of contracted pelvis is made from:—

(A) The history,
(B) The appearance,
(C) The symptoms of the patient,
(D) The abdominal and pelvic examination.

(A) **History.**—The history of the patient should be obtained:—

(1) As regards her childhood; to ascertain if there is any evidence of early rickets, such as late dentition,

nability to walk at the proper age, a temporary loss of the power of walking.

(2) As regards her previous labours; to ascertain whether they have been difficult or easy, whether the children were born dead or alive.

(B) **Appearance.**—The appearance of the patient

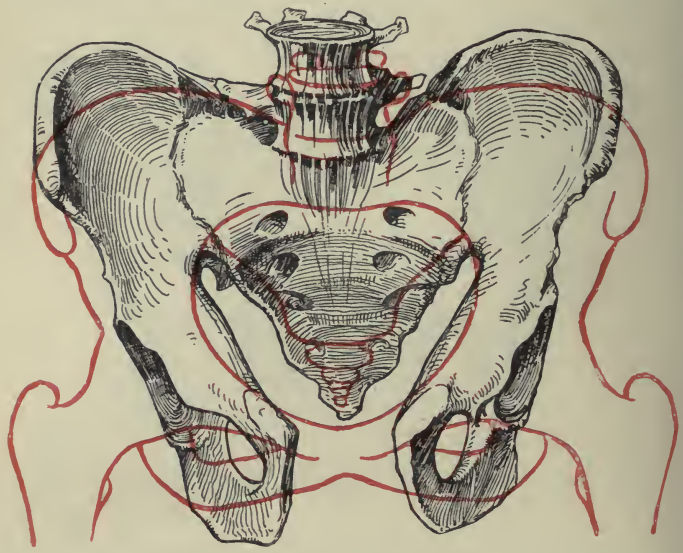


FIG. 154.—The split pelvis.

suggests contracted pelvis if any of the following conditions are present:—

(1) Very small stature.
(2) Pendulous abdomen.
(3) Curvature of the spine:—Kyphosis, lordosis, or scoliosis, particularly when occurring in the lumbar region.

(4) Crooked legs, legs of unequal length, prominence of or impaired mobility in one hip.

(5) Other evidence of rickets.

(c) **Symptoms.**—The symptoms of the patient during pregnancy and labour are of great importance. A contracted pelvis may commence to cause trouble in the early months of pregnancy, as by the fundus of a retroflexed uterus becoming incarcerated beneath the overhanging promontory (*v.* page 311). In the later months, the uterus and the presenting part of the fœtus are pushed up out of the pelvis by the narrow brim, and consequently, the fundus falls forward against the abdominal wall. A pendulous abdomen is thus produced, and malpresentations of the child are common, as has been explained before (*v.* page 41).

When the patient comes into labour, the effects of contracted pelvis are more manifest and important than during pregnancy.

Even in slight degrees of contraction, the head does not fix as early in labour as is usual, while, in the greater degrees, fixation may never occur. In the latter case, the uterine contractions increase in strength and endeavour to force the head through the brim, and failing in this, either die away completely—a condition of missed labour ensuing, or continue until rupture of the thinned lower uterine segment results. The presenting head is prevented from descending and filling the lower uterine segment, and the various consequences of its non-descent follow. The membranes protrude unduly into the vagina as a conical or sausage-shaped swelling, early rupture occurs, the liquor amnii escapes suddenly and completely,

and the cord may be swept down. A remoter consequence, due to the loss of the dilating action of the unruptured bag of membranes, consists in the slow dilatation of the uterine orifice. In some cases, the latter may dilate in the usual manner at the commencement of labour, as long as the membranes remain intact, but on their rupture dilatation ceases, or perhaps the cervix actually closes, to be again dilated by the presenting part.

In consequence of the early rupture of the membranes and the complete escape of the liquor amnii, the full force of the uterine contractions is directly exerted upon the fœtus, and the latter is subjected to a pressure which, if continued for sufficient time, causes its death. Also, the compression of the fœtal head by the narrow brim causes considerable deformity, and, in extreme cases, fracture of the cranial bones may result. The particular shape which the head takes as a result of this moulding depends on the particular variety of contracted pelvis.

If the lower uterine segment or the cervix is nipped between the descending head and the bony pelvis, it becomes œdematous, owing to the obstructed return of blood through the veins. This condition, if at once relieved, is not of any great consequence, but, if allowed to persist, it may lead to serious results, as, first, it offers an additional obstruction to delivery, and may cause rupture of the lower uterine segment; secondly, the anterior lip, or even the entire cervical ring, may be torn off by the descending head; and thirdly, the portion of cervical tissue which is nipped may slough, and

a fistula result. Laceration and sloughing of the vagina may also occur in cases in which the head has passed the brim. Laceration may be the result of an extension of a cervical tear into the posterior fornix; and sloughing and the subsequent formation of fistulæ are due to the compression of the vaginal wall between the presenting head and the bony pelvis. As a rule, such fistulæ form between the bladder and the vagina, but occasionally they form between the rectum and vagina.

During the puerperium, serious complications may result in consequence of the length of labour, the bruising and laceration of the soft parts, and the necessary intra-pelvic manipulations. Such complications are an increased tendency to post-partum hæmorrhage, due to the long-continued labour and consequent exhaustion of the uterine muscle; an increased liability to sapræmic and septic infection, due to the lowered resistance of the bruised tissues, to the stagnation of liquor amnii in the vagina, and to the necessary intra-pelvic manipulations; and the formation of fistulæ, due to the nipping of the soft parts.

(D) **The Abdominal and Pelvic Examination.**—Abdominal palpation often enables us to suspect the existence of a contracted pelvis by telling us the relation between the presenting part and the pelvic brim. If the head presents and is fixed, we know for certain that we are not dealing with a case of contraction of the brim, and, as this is the commonest site of contraction, it is *probable* that there is no contraction present. On the other hand, if the head is felt high above the brim and is movable at a time

at which it ought to be fixed—*i. e.* during the last few weeks of pregnancy in primiparæ, and shortly after the commencement of labour in multiparæ, it is extremely probable that there is some degree of pelvic contraction. Several other conditions, however, also cause non-fixation, so that this condition must not be regarded as a certain proof of contraction.

Vaginal examination may at once reveal the presence of pelvic contraction, as in cases of marked contraction of the outlet, or when we find a low promontory within easy reach of the finger, or an exostosis springing from the pelvic bones. A more careful examination of the sides of the pelvis may reveal flattening of one or both sides in an obliquely distorted pelvis, in Robert's pelvis, or in general contraction of the brim. During labour, information is obtained by abdominal palpation from the non-fixation and high situation of the presenting part, and by vaginal examination from the undue protrusion of the membranes into the vagina during a contraction of the uterus.

If the history, the appearance, the symptoms, or the result of the foregoing examination suggests the possibility of pelvic contraction, we must in all cases resort to the final and conclusive method of making a diagnosis; that is to say, the pelvis must be measured. We have already described the different methods of pelvimetry (*v.* page 70), and here we shall only refer to its application.

Five measurements of value can be ascertained by external pelvimetry:—

(1) *The length of the external conjugate, i. e.* the distance between the upper margin of the symphysis

externally, and the depression under the spinous process of the last lumbar vertebra.—It is normally about 8 inches (20 cm.) in length. If in any case it is found to be less than $6\frac{1}{4}$ inches (16 cm.), there is certainly some degree of contraction present.

(2) *The distance between the iliac spines and the iliac crests.*—The normal distance between the anterior superior spines of the ilia is $10\frac{1}{4}$ inches (26 cm.); between the summits of the iliac crests $11\frac{1}{2}$ inches (28·75 cm.). The distance between the posterior superior spines is normally $3\frac{7}{8}$ inches (9·5 cm.). Considerable shortening of these distances points towards contracted pelvis.

(3) *The ratio of the distance between the anterior superior spines to the distance between the crests.*—The normal ratio of the distance between the spines, and the distance between the crests, is as $10\frac{1}{4}$ to $11\frac{1}{2}$. If the distance between the spines is either equal to or greater than the distance between the crests, the case is one of rachitic pelvis.

(4) *The ratio of the distances between the anterior and between the posterior iliac spines.*—The normal ratio of the distance between the posterior superior spines to the distance between the anterior spines is as 1 is to 3 or $3\frac{1}{2}$. If the distance between the posterior spines is proportionately increased, so that the ratio becomes less than 1 to 3, the pelvis is probably generally contracted. If, on the other hand, the distance between the posterior superior spines is lessened, so that the ratio is more than 1 to 3, the pelvis is flattened.

(5) *The length of the antero-posterior and the transverse diameters of the outlet.*—The antero-posterior

diameter of the outlet normally measures $3\frac{4}{5}$ inches (9·5 cm.), and the transverse diameter $4\frac{2}{5}$ inches (11 cm.). In cases of contraction its actual length can be ascertained.

By internal pelvimetry we ascertain the actual length of the true conjugate and of the transverse diameter of the brim, and, consequently, the actual size of the latter. From these measurements, and from the measurements of the antero-posterior and the transverse diameters of the outlet, we learn the nature and the degree of any contraction present. The information obtained may be stated as follows:—

(1) If both the conjugate and the transverse diameters of the brim are diminished, but still preserve their normal ratio to each other, we are dealing with a case of generally contracted pelvis. In such cases it is probable that there is also some narrowing of the outlet.

(2) If the conjugate diameter alone is diminished, we are dealing with a case of flat pelvis.

(3) If both conjugate and transverse diameters are diminished, but the conjugate is diminished out of proportion to the transverse, we are dealing with a case of generally contracted and flat pelvis.

(4) If the transverse diameter is much diminished and the conjugate increased, we are dealing with a case of Roberts' pelvis.

(5) If the transverse diameter of the outlet is much diminished and there is a marked increase in the conjugate of the brim, we are probably dealing with a kyphotic pelvis.

(6) If both antero-posterior and transverse diameters of the outlet are much diminished, with-

out any noteworthy increase in the diameters of the brim, we are dealing with a funnel-shaped pelvis.

Mechanism.—When the pelvis is contracted, but the degree of contraction is not so great as to prevent the passage of the head, the mechanism of a vertex presentation differs considerably from the mechanism which occurs in the case of a normal pelvis. The mechanism also varies in the different forms of contracted pelvis.

Generally Contracted Pelvis.—The most important point in the mechanism of this variety of pelvis is that the normal flexion of the head is exaggerated; consequently, the small fontanelle lies relatively deeper in the pelvis than usual—posterior fontanelle presentation (*v.* page 231). With this exception, the mechanism is similar to that in a normal pelvis.

Flat Pelvis.—The head enters the brim with its sagittal suture lying in the transverse diameter of the brim. At first one parietal bone rests upon the symphysis, the other upon the promontory. As the uterus contracts, the head is pushed towards the side of the pelvis at which the occiput lies. This movement brings the bi-temporal diameter, instead of the bi-parietal diameter, into the conjugate, and also causes a certain amount of extension of the head, as the sinciput, being smaller than the occiput, descends more rapidly. As a result of this, first, a diameter of $3\frac{3}{4}$ inches (9·4 cm.) is replaced by one of $3\frac{1}{5}$ inches (8 cm.), and, secondly, the anterior fontanelle lies lowest—anterior fontanelle presentation (*v.* page 229). The head then rotates round its antero-posterior axis in such a manner, that the

sagittal suture approaches the promontory of the sacrum, and the anterior parietal bone lies lowest. This relation of the head to the brim is termed posterior asynclitism. If the degree of contraction is not too great to permit of the passage of the head through the brim, the mechanism described under posterior asynclitism occurs, and the head passes the brim (*v.* page 168). If the degree of contraction is too great, rotation of the head continues until the sagittal suture lies above the promontory of the sacrum and the ear presents.

Generally Contracted Flat Pelvis.—The mechanism in these cases is usually a combination of the mechanism that occurs in a generally contracted and in a flat pelvis. The head engages in the transverse diameter of the pelvis. Marked flexion occurs, so that a posterior fontanelle presentation results. Posterior asynclitism also occurs in consequence of the rotation backwards of the sagittal suture.

Treatment.—In dealing with the common forms of contracted pelvis, four degrees of contraction are recognised. These degrees are based on the length of the true conjugate, and, within the limits of each degree, special methods of effecting delivery are applicable. In fixing the limits of each degree the presence of contraction of the transverse diameter of the pelvis must also be taken into consideration, as any degree of contraction in the conjugate is manifestly less serious if the transverse diameter is of normal length, than is the same degree in association with transverse narrowing. Accordingly, the limits of each degree as shown by the length of the true conjugate, must differ slightly according as we are

dealing with a case of flattening alone, or of general contraction.

The various degrees of contraction and the treatment suitable to each may be classified as follows :—

Degree.	Length of C.V. in flat pelvis.	Length of C.V. in generally contracted pelvis.	Treatment.
1st	4—3¼ ins. (10—8 cm.)	4—3½ ins. (10—9 cm.)	Prophylactic version; or leave to nature,—*i. e.* allow the head to mould through the brim.
2nd	3¼—2¾ ins. (8—7 cm.)	3½—3 ins. (9—7·5 cm.)	Premature labour; version; pubiotomy, symphysiotomy or Cæsarean section; craniotomy.
3rd	2¾—2¼ ins. (7—5·5 cm.)	3—2½ ins. (7·5—6 cm).	Cæsarean section; craniotomy.
4th	Below 2¼ ins. (5·5 cm.)	Below 2½ ins. (6 cm.)	Cæsarean section.

(1) In the first degree of contracted pelvis there is a choice between prophylactic version, and leaving the head to mould. We do not include the application of the forceps while the head is above the brim as a mode of treatment. Its use is only necessary if the force and frequency of the uterine contractions are below the normal; otherwise, if the forceps will bring a head through a contracted brim, the contractions of the uterus will also bring it through, with less danger to mother and child. When we make up our mind to allow the contractions to mould the head through the brim, the only special assistance we can render is by placing the patient on the correct side. In a generally contracted pelvis, she should lie upon the side at which the posterior fontanelle is, in order to favour its descent. In a flat pelvis, she should

lie at first upon the side at which the forehead is, in order to favour the descent of the anterior fontanelle, and, as soon as this takes place, upon the opposite side, to favour the descent of the occiput. With this exception, we leave the case to nature, until signs of danger to the mother or child appear. In such cases we may apply the forceps, on the supposition that the pelvic contraction may not be so great as we think. If it fails, or if the child is already dead, we must perforate. It is, of course, obvious that, as soon as the head has passed the site of contraction, the forceps may be used without any hesitation if labour is still protracted, as the case has then ceased to be one of contracted pelvis as far as the treatment is concerned.

Prophylactic version consists in performing podalic version at the commencement of labour. This is done because the head moulds better when compressed from below upwards, *i. e.* as an after-coming head, than it does when compressed from above downwards, *i. e.* as a fore-coming head. But, on the other hand, it must be remembered that, when the head comes first, it may take many hours to come through the brim without detriment to the child. When the head comes last, it must be brought through the brim in, at most, one minute, or the child will die of asphyxia. The advantage given by Walcher's position is in favour of the adoption of prophylactic version, as it is easy to keep the patient in such a position for the short time necessary for the extraction of the after-coming head, but quite impossible to keep her so for the hours necessary for the moulding of the fore-coming head. Prophylactic

version is a valuable method of treatment in a flat pelvis; but in a generally contracted pelvis it is of little use, since the long transverse diameters of the pelvis, into which the long antero-posterior diameters of the head can be turned, are lacking. Further, as a general rule, it is found that, while in the hands of a skilled obstetrician prophylactic version in a flat pelvis gives better results than moulding, an unskilled obstetrician obtains better results by allowing the head to mould.

(2) For the second degree of pelvic contraction premature labour is undoubtedly the best treatment. If we do not see the patient sufficiently early in pregnancy to adopt this mode of treatment, then prophylactic version, symphysiotomy, pubiotomy, or Cæsarean section must be performed. The first is perhaps the most suitable in a flat pelvis. The objection to it is that, if we fail to deliver the after-coming head, we have substituted an operation which may be most difficult—*i. e.* perforation of the after-coming head, for one that is comparatively easy—*i. e.* perforation of the head coming first. Pubiotomy is easier and safer than symphysiotomy, and it or Cæsarean section is preferable in a generally contracted pelvis. The objection to pubiotomy is the number of assistants it requires, and the difficulty of the after-treatment. The skilled obstetrician, however, will probably choose it, while the unskilled will choose Cæsarean section. If none of the foregoing operations can be performed, craniotomy will be necessary.

(3) For the third degree of pelvic contraction Cæsarean section is the only treatment that will

save the child. If it cannot be performed, craniotomy will be necessary.

(4) For the fourth degree of pelvic contraction, *i. e.* absolute pelvic contraction, Cæsarean section is the only advisable mode of delivery. Extraction of even

Fig. 155.—Walcher's position.

a mutilated child is too dangerous an operation to be undertaken.

Walcher's Position.—Walcher's position may be of considerable use in any case in which a slight temporary enlargement of the conjugate diameter of the brim is required. It consists in placing the patient in the dorsal position, with her hips so far over the edge of the bed that her legs hang freely down,

without any support. The lower portion of her body then rests upon the sacrum, and the weight of the unsupported lower limbs is transmitted through the ilio-femoral (Y-shaped) ligament to the pelvis. The movement, which the sacro-iliac joints allow, permits as much of the pelvis as is formed by the innominate bones to be drawn downwards by the

Fig. 156.—Diagram showing the increase in the C.V. brought about by Walcher's position. The dotted outline represents the new position of the pelvis, when dragged downwards by the weight of the limbs. (Slightly modified from Fothergill.)

weight of the limbs, as if it was rotating round the sacro-iliac joints. In this way the symphysis comes to lie at a lower level than is usual, so increasing the true conjugate (*v.* Fig. 156). The average increase in the latter is from a third to half-an-inch (Walcher).

Premature Labour.—The correct time at which to induce premature labour, for the different degrees of pelvic contraction, is shown in the following table :—

Conjugata Vera.	Time to induce Labour.
3 inches (7·5 cm.)	30th week.
$3\frac{1}{4}$ „ (8 cm.)	32nd „
$3\frac{1}{2}$ „ (8·75 cm.)	36th „

This manner of ascertaining the date at which to

Fig. 157.—Müller's method of ascertaining the date at which to induce labour. O. O. Operator's hands. A. A. Assistant's hands.

induce labour is open to two objections. In the first place, it is extremely difficult to be certain that we are correct in our calculations of the duration of

pregnancy. In the next place, even if we can tell the exact age of pregnancy, this table makes no allowance for the different sizes of children's heads.

Müller's method of ascertaining the date at which to induce labour is much more exact, and allows both for the degree of contraction of the pelvis, and for the size of the child's head. It is carried out as follows:—Place the patient in the cross-bed position, or upon a Schroeder's gynæcological chair. Introduce two fingers into the vagina, and palpate the presenting head. Then, grasp the head with the left hand, the fingers over the occiput and the thumb over the chin, or *vice versâ*, according to the position of the fœtus, and press the head into the brim while an assistant supplements this force by also pressing down with both hands superimposed on the operator's hands as shown in the diagram (*v.* Fig. 157). If the head descends behind the symphysis, it is too soon to induce labour. This manipulation should be performed, at intervals of a few days, until the day comes that the head cannot be forced through the brim. The first day on which this occurs, is the day on which labour should be induced.

CHAPTER XXIV.

OBSTRUCTED DELIVERY.

Abnormalities on the part of the Mother: Contracted Pelvis—Tumours, of the Uterus, of the Vagina and Vulva, of the Pelvis, of the Ovaries—Stenosis and Atresia, of the Cervix, of the Vagina—Malformations of Uterus and Vagina—Malpositions of Uterus. Abnormalities on the part of the Fœtus: of Presentatation, Position, Attitude—of Size—Malformations and Tumours—Monsters.

It will perhaps be found of advantage to group the various causes of complete or partial mechanical obstruction to delivery in a single chapter, and to describe briefly those that are not mentioned elsewhere. The following table shows the various causes of such obstruction :—

Abnormalities on the part of the mother.

(I) Contracted pelvis.

(II) Tumours :—(A) of the uterus ; (B) of vagina and vulva; (C) of the ovaries; (D) of the pelvis.

(III) Stenosis and atresia :—(1) of the cervix ; (2) of the vagina.

(IV) Malformations of uterus and vagina.

(V) Malposition of uterus.

Abnormalities on the part of the fœtus.

(I) Presentation. Position. Attitude.

(II) Size :—(A) of entire fœtus ; (B) of shoulders.
(III) Malformations and tumours.
(IV) Monsters.

ABNORMALITIES ON THE PART OF THE MOTHER.

I. Contracted Pelvis.

Contracted pelvis has been already discussed (*v.* page 396).

II. Tumours of the Uterus, etc.

Tumours of the Uterus.—The tumours of the uterus which tend to interfere with delivery are fibro-myomata, and carcinoma of the cervix. The former cause trouble in one or more of the following ways :—

(1) by weakening or mechanically interfering with the contractions of the uterus.
(2) By offering an obstacle to the descent of the presenting part.
(3) By causing malpresentation.

Carcinoma of the cervix obstructs labour not so much by its size as by the structural change in the cervical tissue preventing dilatation of the cervix.

Diagnosis.—Sub-peritoneal myomata lying above the pubes can be recognised during abdominal palpation, by noting the irregularity of the uterine surface. Interstitial myomata of any considerable size, if situated on the anterior uterine wall, can also be recognised by this method of examination, by noting

that in one part of the uterus a resisting mass lies between the hand and the fœtal parts, while elsewhere the parts can be readily palpated. Myomata of any considerable size springing from the lower part of the uterus and lying below the pelvic brim, can be recognised by vaginal examination, by finding a tumour projecting into the uterine cavity or embedded in the thickness of the uterine wall, and interfering to a greater or lesser extent with the descent of the presenting part; while polypi, projecting from the cervix, will be found in the vagina. Carcinoma of the cervix can also be recognised during vaginal examination, by noting the condition of the cervix. According to the form of carcinoma present, the cervix will be ulcerated and partially destroyed, or enlarged and projecting in cauliflower-like masses into the vagina.

Treatment.—Pedunculated myomata, or myomata growing from the cervix, should be removed as soon as recognised. Both will most probably offer an obstruction to the descent of the presenting part, and polypi run a serious risk of sloughing subsequently to delivery owing to interference with their blood-supply. Myomata growing from the lower part of the body of the uterus will in many cases be drawn up during the last month of pregnancy, or during labour, by the retraction of the uterine muscle. If this does not occur, they must, if possible, be pushed above the presenting part. If they are evidently becoming impacted in the pelvis in such a manner as to offer a bar to the descent of the presenting part, and if they cannot be removed *per vaginam*, Cæsarean section or craniotomy must be

performed. If the former operation is performed, it may be well to perform hysterectomy at the same time.

In apparently operable cases of carcinoma of the cervix, labour or abortion should be induced, and followed by hysterectomy as soon as possible after delivery. If the condition of the cervix will not allow delivery through it, Cæsarean section must be performed, followed by hysterectomy, if the growth can be removed. In a few instances, it may be possible to obtain the necessary amount of dilatation by means of hydrostatic dilators. Room may also be obtained by deep incisions of the cervix, extending from the uterine orifice to the vaginal vault, or even higher—after preliminary separation of the bladder from the uterus (Dührssen). The objection to incisions in these cases is that they facilitate the generalisation of the growth. Consequently, this mode of dilatation ought only to be adopted in those cases in which the condition of the patient, or the attendant circumstances, prevent the performance of Cæsarean section, and in which the narrowing of the cervix is so great as to prevent the extraction of the child even after the performance of craniotomy or embryotomy.

Tumours of the Vagina and Vulva.—Apart from uterine polypi which have been extruded into the vagina, hæmatoma of the vulva or vagina and extensive œdema of the vulva are the most common forms of vaginal obstruction met with. Both conditions are referred to in other places (*v.* pages 289 and 477). Carcinoma of the vagina or vulva may also be met with. As a rule, it is not so extensive

as to interfere with delivery, but, if it is, Cæsarean section must be performed. If the case is operable, the uterus should be emptied as soon as the condition is recognised, and total removal of the uterus and vagina performed.

Tumours of the Ovary.—Tumours of the ovary, unless of extreme size, do not interfere to any great extent with the course of labour, except when they become so impacted in the pelvis as to prevent the descent of the presenting part.

Diagnosis.—The diagnosis, in the case of ovarian tumours which lie above the brim of the pelvis, is made by abdominal palpation ; or in the case of those lying in the pelvic cavity, by vaginal examination. They are distinguished from fibro-myomata of the uterus by determining the fact that they are separate from the uterus, and by the history of the patient.

Treatment.—If the tumour lies in the pelvis, an attempt is made to push it above the presenting part. If this succeeds, well and good. If not, and if we are dealing with a cystic tumour, the latter may be punctured with a trocar and cannula from the vagina, care being taken to ensure as perfect asepsis as possible. Even if the size of the tumour does not prevent delivery, it is well to evacuate the contents in all cases in which the tumour lies in the pelvis and cannot be pushed above the presenting part. Such a proceeding obviates the possibility of rupture during labour, or of necrotic changes occurring subsequent to labour as a result of the crushing the tumour has undergone. In all cases in which the

tumour has been punctured, it should be removed at the earliest possible date, and, indeed, in hospital practice it is probably better to remove it as soon as it is diagnosed instead of puncturing it.

In the case of a solid tumour, which cannot be pushed out of the pelvis, ventral or vaginal cœliotomy may be performed and the tumour removed. If this is impossible, owing to the impaction of the tumour in the pelvis, Cæsarean section should be performed, and the tumour removed as soon as the uterus has been emptied. Craniotomy may only be performed if a cœliotomy is out of the question, and, indeed, in some cases its performance may be impossible owing to the position of the tumour.

In any case in which an ovarian tumour is present, and is not removed during labour, it ought to be removed a few weeks later, or even sooner if there is any necrotic or septic change taking place in it.

Tumours of the Pelvis.—The following tumours growing from the pelvic bones, are sometimes met with:—bony exostoses, enchondroma, fibroma, sarcoma, and carcinoma. According to their situation and size, they cause a varying degree of obstruction to delivery.

Diagnosis.—The diagnosis is made by vaginal examination. A tumour is felt, which is not connected with the uterus or appendages, but is connected with the pelvic wall. At the same time, its nature, *i. e.* bony or otherwise, its exact position, and the degree to which it encroaches upon the pelvic cavity must be determined.

Treatment.—The treatment depends on the degree

of obstruction which the tumour causes. If the latter is not of large size, it may be possible to deliver the child past it, either by means of the forceps or by podalic version and traction on the legs. If neither of these methods can be adopted, Cæsarean section or craniotomy must be performed. If the narrowing caused by the tumour is so extreme as to prevent the passage of even a mutilated child, Cæsarean section alone can be performed.

III. Stenosis and Atresia of the Genital Passages.

Stenosis and Atresia of the Cervix.—By the term stenosis of the cervix (*στένος*, narrow) is meant a narrowing of the cervical canal; by the term atresia (*ἀ*, negative; *τετραίνω*, I perforate) an imperforate condition of the cervical canal.

Ætiology.—It is obvious that, as pregnancy has occurred, the cervical canal must have been perforate at the time of fertilisation. Consequently, we may regard stenosis and atresia as merely different stages of the same condition. Atresia or stenosis of the os externum may occur in elderly primiparæ as a result of increased rigidity of the muscle-fibres of that part, with, in the case of atresia, the addition of an adhesive vaginitis or endocervicitis. Atresia, or stenosis of the vaginal portion may result, also in elderly primiparæ, from a diminution in the number of elastic fibres, a consequence of commencing senile atrophy (Dührssen). Stenosis affecting more or less the entire cervix may occur as a result of long-continued prolapse of the cervix outside the vagina,

leading to hypertrophy of the cervical tissues; of a too extensive or badly performed Schroeder's amputation of the cervix; or, of extensive sloughing of the cervix, due to a former unduly prolonged labour, or to the improper use of caustics. Stenosis is also a frequent result of carcinoma of the cervix.

Diagnosis.—Stenosis of the cervix is recognised on making a vaginal examination by finding it impossible to pass a finger into or through the cervical canal when, under normal circumstances, it should be possible to do so. Rigidity of the cervical tissues is diagnosed if the cervix in part or entirely fails to be taken up and dilated in the ordinary manner, in spite of the occurrence of strong labour pains. According to the extent of cervical tissue whose structure or elasticity is affected by the change, more or less of the cervix can be felt *per vaginam*, as a band of varying thickness, which preserves the normal shape of the non-pregnant cervix.

Treatment.—The treatment to be adopted depends upon the cause of the condition. In cases of simple agglutination of the edges of the os externum, slight pressure with the finger or with the point of a uterine sound will probably succeed in reopening the canal. If the cervix is rigid from change in its structure or loss of elasticity, hot baths and frequent hot vaginal douches should be administered. If these fail, dilatation may be effected by Frommer's modification of Bossi's dilator, by multiple incisions of the cervix, or by hydrostatic dilators (*v.* pages 526–533). The first is the preferable course, but, in cases in which tissue change is marked, multiple incisions will probably have to be made. Hydrostatic dilators of the type

of Barnes' or Champetier de Ribes' bags are all objectionable because they necessitate prolonged manipulation, and because by their denudatory effect upon the cervical epithelium they appear to prepare a path for the subsequent passage of septic organisms and toxins. The treatment proper to carcinoma of the cervix has already been described (*v.* page 439).

Stenosis of the Vagina and Vulva.—Stenosis of the vagina or vulva may occur as the result of congenital malformations, of extensive ulceration, or of the presence of maligant disease.

Diagnosis.—There is no difficulty in making a diagnosis by inspection and vaginal examination.

Treatment.—If congenital bands, or slight degrees of cicatricial narrowing are present, division of the bands or deep incisions of the vaginal wall or perinæum, may enable delivery to occur. If, however, there is so considerable a degree of narrowing that the necessary space cannot be obtained in this manner, Cæsarean section or craniotomy will have to be performed.

IV. Malformations of the Uterus and Vagina.

The effects of malformations of the uterus and vagina on labour have already been described (*v.* page 315).

V. Malpositions of the Uterus.

The effects of malpositions of the uterus on labour have also been already described (*v.* page 309).

ABNORMALITIES ON THE PART OF THE FŒTUS.

I. Abnormalities of Presentation, Position, and Attitude.

Presentations.—All presentations, save vertex and pelvic presentations, tend to offer a greater or less degree of obstruction to delivery. As they have been already described, it is unnecessary to refer to them again.

Positions.—In vertex presentation, difficulties may occur during labour owing to the backward rotation of the occiput. This condition is termed occipito-posterior position of the vertex, and has been already discussed (*v.* page 168). In pelvic presentation, the occiput of the after-coming head may rotate backwards into the hollow of the sacrum, and so give trouble (*v.* page 241). Lastly, in face presentation, the chin may rotate posteriorly, and similarly in brow presentation the face may rotate posteriorly, and increase to a very great extent the difficulties which always attend these presentations (*v.* pages 217 and 227).

Attitude.—The normal attitude, which the fœtus assumes in the uterus, has been already described (*v.* page 39). In certain cases, changes in the attitude of the limbs are met with, and may offer an obstruction to delivery. These changes are as follows :—

(A) Prolapse of the hand or arm beside the head.
(B) Nuchal position, *i. e.* dorsal displacement of the arm.
(C) Prolapse of the hand and foot, or of hands and feet.
(D) Prolapse of a hand or arm.
(E) Prolapse of a foot or leg.

(A) **Prolapse of a Hand or Arm beside the Head.**—In this condition one or other hand or arm is found in the pelvis accompanying a cephalic presentation (*v.* Fig. 158).

Frequency.—This condition is said to occur about once in 425 cases (Galabin).

Ætiology.—Prolapse of the hand or arm is more likely to occur in cases in which the tone of the fœtal tissues is impaired, as, for instance, in a dead fœtus. It may also occur as the result of disproportion between the head and the pelvis—too large a pelvis, or too small a head; antero-posterior contraction of the pelvis; and sudden escape of a large quantity of liquor amnii, as in hydramnios.

Diagnosis.—The diagnosis of the condition is made on feeling the prolapsed limb by vaginal examination.

Treatment.—If the head is still free at the brim, the patient is placed on the side opposite to that at which the prolapse has occurred, as the resultant change in the inclination of the fœtus may bring about the reposition of the arm. If it does not do so, the operator passes his hand into the vagina, and pushes the arm above the greatest convexity of the

head. If the arm is prolapsed and the head is impacted in the pelvis, delivery is left to nature, unless indications appear which necessitate its immediate completion. In these cases the forceps is applied, care being taken not to include the prolapsed limb between the blade and the head.

(B) **Nuchal Position of the Arm.**—Nuchal position, or dorsal displacement of the arm, is the term applied to

FIG. 158.—Prolapse of the hand behind the head. Note the associated posterior asynclitism of the head.

the attitude of the arm when the latter is displaced behind the neck of the fœtus.

Ætiology.—Nuchal position of the arm may occur in either cephalic or pelvic presentations (*v.* Fig. 159). In the former it is difficult to account for its occurrence. In the latter it is sometimes the result of rotating the body of the child in such a direction that the friction of the pelvis tends to carry the arm behind the neck.

Diagnosis.—Nuchal position of the arm in a

cephalic presentation probably will not be diagnosed until after the birth of the fœtus unless it causes an obstruction. Then, it may be determined by passing the fingers above the head and feeling the arm lying behind the back. In the case of a pelvic presentation, the condition will be discovered when the hand is passed into the vagina in order to bring down the arms (*v.* page 246).

Treatment.—If the condition occurs in association

Fig. 159.—Nuchal position of the arm in a pelvic presentation.

with a head presentation, three modes of treatment have been suggested. The first of these is to endeavour to draw the arm down beside the anterior portion of the head (Simpson). The case then becomes one of prolapse of the hand with the head, and is treated accordingly. The second method consists in endeavouring to rotate the head, by grasping it with the fingers in the vagina, in such a direction that the friction of the pelvic wall will bring the arm forwards. Probably this will seldom be possible. The third mode of treatment consists

in performing podalic version, and while doing so replacing the arm.

The management of a nuchal position occurring in association with a pelvic presentation, has been already described (*v.* page 247).

(C) **Prolapse of a Hand and Foot.**—Prolapse of both a hand and foot together is an occasional accompaniment of transverse presentations. Treatment consists in drawing down the foot and at the same time pushing up the head. As this is done, the arm will slip back into the uterus.

(D) **Prolapse of a Hand or Arm.**—This is also an accompaniment of a transverse presentation. Its occurrence is the rule in so-called "neglected shoulder presentation." Its treatment has been described (*v.* page 260).

(E) **Prolapse of a Foot or Leg.**—This is only another term for an incomplete pelvic presentation (*v.* page 234).

II. Abnormalities of Size.

The fœtus may offer an obstruction to delivery owing to its excessive size as a whole, or to the excessive size of the shoulders alone.

(A) **Excessive Size of the Entire Fœtus.**—This condition does not commonly prevent delivery, if the pelvis is normal. It will, however, make labour more tedious.

Diagnosis.—The diagnosis can rarely be made until

after delivery. We may form an idea that the fœtus is of undue size by palpation and by noting the extent to which the cranial bones overlap, but it is difficult to be sure that we are correct.

Treatment.—The expulsion of the fœtus is left to the natural efforts as long as possible. If the symptoms of prolonged labour appear, the forceps is applied. If this fails, perforation must be performed.

(B) **Excessive Size of Shoulders.**—The shoulders may cause obstruction on account of their size both in cases in which the fœtus as a whole is larger than usual, and in cases in which there is no reason for suspecting excessive size from the size of the head.

Diagnosis.—The diagnosis of enlargement of the shoulders is made when external rotation of the head fails to take place. If the hand or fingers are then passed into the vagina, the obstructing shoulders can be felt blocking the pelvis.

Treatment.—If the shoulders do not follow the head, press firmly on the fundus in order to drive them down. If this fails, traction on the head may be made at the same time. If the shoulders still will not advance, place the patient in the cross-bed position, pass the fingers into the vagina and ascertain the position of the shoulders and back relative to the pelvis. Then, introduce the hand corresponding to the back, and hook one or two fingers into the posterior axilla and apply traction. If this still fails, introduce a couple of fingers of the other hand into the anterior axilla, and apply traction with both hands simultaneously.

If the shoulders still will not move, one or both arms must be brought down. To do this, pass the whole hand into the vagina, and a couple of fingers upwards along the posterior arm, until the elbow is reached. Then, by gentle pressure below the elbow, the forearm is made to flex, and the hand can be seized and drawn out. The anterior arm is then brought down in a similar manner. By this means, the width of the chest is diminished by the thickness of the shoulders. Traction can now be made upon both arms and upon the head.

If, in spite of this, the thorax still does not follow, a hand must be passed into the uterus as far as is necessary, to determine the existence of any further complication. If it is obvious that the size of the shoulders is causing the obstruction, and if all other means, short of embryotomy, fail, cleidotomy (division of the clavicles) may be tried (*v.* page 591). The operation is performed by means of a pair of stout scissors, and by enabling greater compression of the shoulders, effects a reduction of four centimetres or even more in the bis-acromial circumference. It is also said not to be incompatible with the subsequent life of the child. At any rate, it is a more simple operation than is embryotomy. If cleidotomy fails, then embryotomy must be performed, and some of the viscera removed (evisceration).

III. Malformations and Tumours.

Malformations and tumours of any part of the fœtal body may occur, and may be of sufficient size

to interfere with the process of delivery. The following are those most frequently met with:—

(1) Hydrocephalus, the term applied to an accumulation of fluid in the cavity of the cranium.

(2) Hydromeningocele, a consequence of external hydrocephalus, in which a portion of the arachnoid membrane, distended with fluid, prolapses through a gap in the skull and forms a tumour on the cranium.

(3) Hydrencephalocele, a consequence of internal hydrocephalus, in which, as a result of excessive accumulation of fluid in the ventricles, a sac formed of the meninges and of the brain itself, and, distended with cerebro-spinal fluid, is driven through a cleft in the cranium so as to form a tumour on the cranium. According to its position, the sac is distinguished as *hydrencephalocele anterior, posterior, lateralis, superior,* or *inferior* (Winckel). It is much less common than the previous condition.

(4) Cystic hygroma of the neck, a cystic tumour which originates in degenerated lymphatic vessels. The tumour may be situated either in front or behind, and sometimes extends far down into the thorax. As a rule it is multilocular, but sometimes it is unilocular, although traces of previously existing septa can be found.

(5) Congenital cystic goitre (*struma cystica*) has sometimes been met with, as also congenital goitre due to hyperplasia of the gland.

(6) Hydrothorax—a collection of fluid in the pleural cavity.

(7) Tumours of the liver, spleen, and kidney occasionally occur of such a size as to obstruct delivery.

(8) Spina bifida, a cystic tumour filled with cerebro-

spinal fluid, which forms over the spinal column, due to the protrusion of the meninges of the cord through a fissure.

(9) Hydroperitoneum,—a collection of ascitic fluid in the peritoneal cavity.

(10) Hyper-distension of the bladder, due to impermeability of the urethra.

Diagnosis.—The diagnosis of the nature of these cases is made by abdominal palpation and vaginal examination, or sometimes by passing the hand above the presenting part into the uterine cavity. A hydrocephalic head is recognised on palpation—by its size, and on vaginal examination—by noting the separation of the cranial bones, the size of the fontanelles, and the softness of the head. A hydromeningocele and a hydrencephalocele may be mistaken for unruptured membranes. A diagnosis is made by feeling the hair on the head, and by noting the thickness of the sac wall. A mistake in diagnosis is not of any great importance, as the hydromeningocele will have to be punctured if it does not burst. Tumours and cystic conditions of the body of the fœtus, and the various forms of monster, will be recognised when they cause an obstruction to delivery, if the hand is passed into the uterus, and the fœtal parts are examined.

Treatment.—A hydrocephalic head—if it causes an obstruction—must be tapped through a suture. The natural efforts will then usually effect delivery. If delivery does not occur, the head is extracted by means of the forceps or a cranioclast, or version is performed. Cystic tumours must be punctured, if they cause an obstruction. Collections of fluid in the

pleural or peritoneal cavity must also be punctured, or, if necessary, aspirated.

IV. Monsters.

It is impossible to describe here all the various so-called monsters which may occur. The following are the forms most commonly met with :—

(A) **Anencephalic Monster.**—In this form the cranium and brain are absent. The neck is short, and the shoulders are broader than usual. It is a condition commonly associated with hydramnios, spina bifida, and face or brow presentation.

(B) **Acardiac Monster.**—This is a condition which is met with in multiple pregnancy from the same ovum, in which one fœtus becomes a parasite and lives upon the other. The circulation of one twin may be stronger than that of the other, consequently it overpowers the weaker circulation, and thus a single heart carries on the circulation of both twins by means of an anastomosing circulation in the common placenta. The result is, that, while such tissues of the weaker fœtus as lie near the main branches of the umbilical vessels receive sufficient blood to continue the development of a low form of tissue, the more distant tissues do not develop.

(C) **Double Monsters.**—Double monsters are formed by the more or less complete union of twins developed from the same ovum. Obstetrically, they may be divided into two general groups :—Those in which

one end of the fœtus is doubled, and those in which there are two outwardly distinct children united one to another more or less intimately.

In the former class are included cases of two heads (dicephalous), two faces (diprosopus), a double pelvis and lower limbs (dipygus), in which the rest of the body is single. In the latter class are included cases in which fusion takes place at some one place, the body above and below the site of fusion being double. These cases are divided into the following groups, according to the place at which union takes place :—

(1) Cephalopagus monsters, united at the head.
(2) Thoracopagus monsters, united at the level of the thorax and abdomen.
(3) Ischiopagus monsters, united at the level of the pelvis.

Diagnosis.—A suspicion of the presence of a double monster may be got from abdominal palpation. Usually, however, the presence of a monster is not recognised until the latter obstructs delivery. Then, on passing the hand into the uterus, the condition of affairs is determined.

Treatment.—In monsters, the general rule is to bring down the feet as soon as the condition of affairs is diagnosed. If delivery does not then result by the natural efforts, employ traction. If this fails, embryotomy will be necessary. Similarly, in cases of solid tumours of the fœtus, if traction either by the forceps or on the feet fails to deliver, embryotomy will have to be performed.

CHAPTER XXV.

PROLAPSE OF THE CORD.

Difference between Presentation and Prolapse of the Cord— Ætiology — Diagnosis — Treatment: Reposition, Version, Forceps.

By the term presentation of the cord is meant that the cord lies in front of the presenting part, the membranes being unruptured. Prolapse of the cord is the term applied to the same condition after the membranes have ruptured.

Ætiology.—The commonest cause of presentation or prolapse of the cord may be stated, in general terms, to be any condition which interferes with the adaptation normally existing between the presenting part and the lower uterine segment. The chief of these conditions are:—

(1) Contracted pelvis.
(2) Malpresentations:—face, breech, transverse, and brow.
(3) Hydramnios.
(4) Twins.

In any of these conditions, the presenting part may not fill the lower uterine segment. Consequently, when the membranes rupture, the liquor amnii comes away with a rush, and may carry down

a loop of the cord with it. Prolapse may also occur owing to :—

(5) Low attachment of the placenta, *i. e.* placenta prævia.
(6) An abnormally long cord.
(7) Marginal insertion of the cord into the placenta, *i. e.* battledore placenta.

Fig. 160.—Prolapse of the umbilical cord into the vagina.

Diagnosis.—The diagnosis is obvious in prolapse of the cord. A loop of it can be felt in the vagina, or may even be seen protruding from the vulva. In presentation of the cord, its coils are felt in front of the presenting part, and, if the child is alive, the cord pulsates.

Treatment.—There are three general methods of treatment, one of which must be adopted if the life of the child is to be saved :—

(A) Reposition of the cord.

(B) Substitution of a presentation which permits of the descent of the fœtus without pressure on the cord: *i. e.* podalic version, with or without—

(C) Immediate delivery of the fœtus.

If the cord is not pulsating when the condition is discovered, and if the fœtal heart cannot be heard, the child is dead, and there is no need to interfere. It must always be remembered that the cord stops pulsating at least a minute before the death of the child; consequently, if we know that the pulsations have only just ceased, we should deliver at once, if possible, and not give the case up as hopeless.

(A) **Reposition.**—The manner of performing reposition varies with the conditions present. If it is a case of presentation of the cord, and the presenting part is not fixed, try the *postural treatment.* Place the patient in Trendelenberg's position, *i. e.* with the buttocks raised and the head low; the fœtus will then tend to fall towards the fundus under the influence of gravitation, and the cord may do the same. Examine vaginally while the patient is still in the same position. If the cord has gone up, push the presenting part into the brim of the pelvis, rupture the membranes, and then allow the patient to lie down again. Keep the presenting part pressed into the brim until a contraction fixes it, or apply a tight abdominal binder with the same object. An extempore Trendelenberg's table can be made by placing an ordinary square kitchen chair on its face along the bed, and covering it with pillows in order to protect the patient. By this means, the body is placed on

an inclined plane, which is just as efficacious and far more comfortable for the patient than the knee-chest position.

If this method does not succeed, or if the membranes are ruptured, an attempt must be made to replace the cord. This is an extremely difficult operation to perform, for, as fast as we replace one loop, another comes down. The patient should be placed under an anæsthetic, as any straining renders the operation impossible. Then, grasp the cord in the hand, carry it up past the presenting part, and

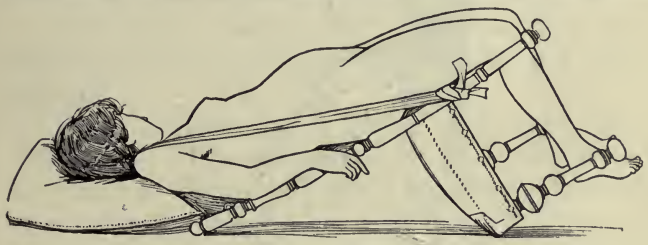


Fig. 161.—Trendelenberg's position.

endeavour to hang it over a limb. As the hand is withdrawn, press the presenting part down into the brim from without.

If the os is not sufficiently dilated to enable the hand to be introduced, or if we fail to replace the cord with the hand, a repositor of some kind may be used. The best form of repositor is made as follows :—Take a No. 10 or 12 gum-elastic catheter with a stilette. Knot together the ends of a piece of sterilised silk about seven inches in length. Pass any part of the loop thus formed through the eye of the catheter, and push the stilette up in such a way that it passes through the loop. The instrument is then

ready. To use it, pass the loop of silk that hangs from the eye of the catheter round the prolapsed portion of the cord, and then throw the loop over the top of the catheter (*r*. Fig. 162). Pass the catheter upwards into the uterus until the cord is above the presenting part, and then withdraw the catheter gradually, at the same time pressing down the presenting part into the brim. So long as the catheter is pushed up, the loop cannot slip off the top of it; but, as soon as we

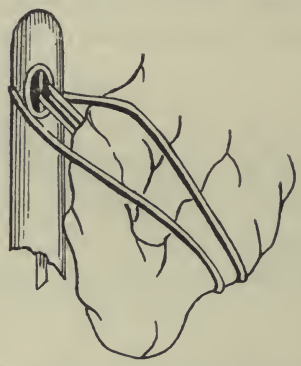


Fig. 162.—Catheter used as a repositor for the cord, showing the manner in which the string is adjusted.

commence to withdraw it, the loop slips off the top, and the cord is set free.

(b) **Podalic Version.**—If reposition fails, as is usually the case, and the head is presenting, turn the child into a breech presentation, and draw down a foot. By this manœuvre we obtain a presentation which is not so likely to press upon the cord as is a head presentation, inasmuch as the breech does not so completely fill the lower uterine segment. The case must be watched very carefully; and, if the cord

stops pulsating, we must, if possible, extract the child at once. Version is performed by the internal or the bipolar method, according to the size of the os. There is one point in which the method of performing version, in a case of prolapsed cord, differs from the usual method. The child should be turned by pushing the head in the direction of its abdomen, *i. e.* in the reverse of the ordinary direction. The object of this proceeding is to keep the umbilicus of the child as far away from the uterine orifice as possible, in order to prevent more cord from prolapsing.

(c) **Immediate Delivery.**—If the os is sufficiently dilated, podalic version may be followed by immediate delivery.

If version cannot be performed, *i. e.* if the head is fixed, the child must be extracted immediately by the forceps. If the os is sufficiently dilated, there will be no difficulty in the proceeding. If it is not dilated, it must be incised (*v.* page 526), and the forceps applied. Never drag the head through an os which is not sufficiently dilated to allow it to pass through without tearing, as a laceration once started may extend into the lateral fornix and open the uterine artery. If incisions are made, they must be sutured immediately after delivery.

While the necessary preparations are being made for any operation for prolapse of the cord, the patient should be placed on the side at which the cord lies. The reason for this proceeding has been explained (*v.* page 260). Also the patient should be told not to strain or "bear down."

CHAPTER XXVI.

POST-PARTUM HÆMORRHAGE.

Primary Post-Partum Hæmorrhage—Varieties—Traumatic Post-partum Hæmorrhage—Atonic Post-partum Hæmorrhage: Plugging with Iodoform Gauze, Injection of Perchloride of Iron — Concealed Hæmorrhage — Secondary Post-partum Hæmorrhage — Post-hæmorrhagic Collapse — Infusion of Saline Solution.

The term post-partum hæmorrhage is, for convenience sake, applied to any hæmorrhage which occurs after the birth of the child, irrespective of the fact that parturition may, or may not, be complete. It is divided into two classes, according to the time at which it occurs :—

(I) Primary post-partum hæmorrhage.
(II) Secondary post-partum hæmorrhage.

PRIMARY POST-PARTUM HÆMORRHAGE.

Primary post-partum hæmorrhage is the term applied to hæmorrhage occurring within six hours after delivery.

Frequency.—The relative frequency of post-partum hæmorrhage depends on the amount of post-partum bleeding which we consider to constitute hæmor-

rhage. In the Rotunda Hospital amongst 25,790 patients the relative frequency of hæmorrhage which required some treatment more energetic than massage of the fundus and the administration of ergot, was 1 in 67·25, *i. e.* 1·48 per cent. The great majority of these cases were cases of atonic hæmorrhage.

Varieties.—There are two varieties of primary post-partum hæmorrhage:—

(A) Traumatic post-partum hæmorrhage.
(B) Atonic post-partum hæmorrhage.

(A) **Traumatic Post-partum Hæmorrhage.**—This is the term applied to hæmorrhage resulting from laceration of some part of the genital canal. There are two situations in which a laceration is likely to cause hæmorrhage, viz.—in the neighbourhood of the clitoris, or in the cervix.

Diagnosis.—The diagnosis has to be made from atonic post-partum hæmorrhage, that is hæmorrhage due to the failure of the uterus to contract. This is easily accomplished by placing the hand on the fundus; if the latter is firm and well contracted, it is obvious that the hæmorrhage cannot be due to the failure of the uterus to contract, *i. e.* it must be traumatic hæmorrhage. In some cases, the diagnosis may not be made until we have commenced to douche the uterus. If a Bozemann's return catheter is used for this purpose, it at once distinguishes between the two conditions. In the case of hæmorrhage from the interior of the uterus, the solution which flows back through the return pipe of the catheter will be blood-stained. If the hæmorrhage

comes from a laceration outside the uterus, the solution in the return pipe will be almost colourless, whilst at the same time blood is seen to flow from the vagina or vulva.

Treatment.—If traumatic hæmorrhage is suspected, examine the region of the clitoris. If there is a laceration which is bleeding, it must be stitched. To do this, pass a silk ligature by means of a small curved needle deeply under one end of it, going right down to the bone, and a second ligature at the other end. Tie them tightly, and the hæmorrhage will cease. The ligatures must be removed in six or seven days. If, on inspection, no laceration can be detected about the clitoris, we must examine the cervix. To do this draw the latter down with a bullet forceps, if there is one to hand, and examine it carefully for a laceration or bleeding vessel. A laceration must be stitched up, a bleeding vessel must be tied. If no bullet forceps is to hand with which to draw down the cervix, an equivalent can be extemporised by means of a piece of surgical silk. Thread a curved needle with a long piece of silk, and pass the needle, held in a needle-holder, up to the cervix under cover of the fingers in the vagina. Then pass the needle through the first part of the cervix that comes to hand, and draw it through, leaving the silk *in situ*. By means of the latter, or, if necessary, by means of two or three pieces of silk so passed, the cervix can be drawn down and exposed. Pressure upon the fundus, by causing descent of the uterus, affords considerable assistance.

(B) **Atonic Post-partum Hæmorrhage.**—This condition

is due to failure of the uterus to contract and retract. It may occur either as an external hæmorrhage, or as an internal or concealed hæmorrhage. The former is very much the more common. The latter is only possible under a radically bad management of the third stage.

Ætiology.—Before entering into the causes of atonic hæmorrhage, it is well to understand what it is that normally prevents the occurrence of hæmorrhage after the detachment of the placenta. This is brought about by three factors :—

(1) The contractions of the muscular coat of the uterus.

(2) The retraction of the muscle-fibres of the uterus.

(3) The clotting which occurs in the mouths of the vessels.

The difference between contraction and retraction has been already explained (*v.* page 120), and it has been mentioned that the former is intermittent, the latter continuous. The latter is therefore the more important. The third means by which hæmorrhage is checked is of little or no importance, *i. e.* the clotting of blood in the open mouths of the vessels. It is probably the result of the checking of the hæmorrhage, and not the cause of it. We may, then attribute the permanent cessation of hæmorrhage after the detachment of the placenta to the retraction of the uterine fibres. Contraction of the uterus will check hæmorrhage during the period of contraction, but retraction, once established thoroughly, prevents the occurrence of any further hæmorrhage.

We can now understand the causes of atonic post-partum hæmorrhage. Considered generally, they include anything which interferes with the due retraction of the uterine muscle-fibres. They are as follows :—

(1) Retained placental fragments, membranes, or blood-clots, *i. e.* bad management of the third stage of labour.

(2) Uterine inertia, which may in turn be due to such conditions as weak muscular development of the uterus, over-distension of the uterus as in hydramnios or twins, metritis, and protracted labour.

(3) Precipitate labour.

(4) Any condition which weakens the patient, as previous hæmorrhages and wasting diseases.

(5) Tumours of the uterus, as myomata.

(6) Placenta prævia.

Treatment.—The most important point, in the successful treatment of post-partum hæmorrhage, is to have a definite plan of action laid out,—a plan which commences with the mildest measures, and goes gradually on to more serious measures, if necessary. The following is such a plan, in the order that should be adopted, and presupposing that the failure of each measure in turn requires the adoption of the subsequent one :—

(1) Ascertain whether the placenta is in the uterus or in the vagina. If it is in the uterus, stimulate the fundus to contract by gentle friction. If the bladder is distended pass a catheter. If the hæmorrhage still continues, or if the placenta is in the vagina at the beginning,

(2) Endeavour to express the placenta by the

Dublin method; if that cannot be done, wash the patient externally, douche the vagina with creolin solution at a temperature of 100°—120° F., and remove the placenta manually (*v.* page 394).

(3) Stimulate the fundus to contract by friction, and administer ergot. Up to two drachms of the liquid extract (Squibb's) may be given, but more reliable are the hypodermic tabloids of citrate of ergotinin, of which up to $\frac{1}{25}$ of a grain may be administered hypodermically.

(4) Wash the patient externally, and administer a hot vaginal douche, if this has not been already done.

(5) Douche the uterus thoroughly with creolin solution.

(6) Compress the fundus firmly between the fingers of one hand in the anterior fornix and the other hand upon the abdominal wall, thus squeezing out any clots that may be retained. Then repeat the intra-uterine douche.

(7) Introduce the hand into the uterus, and remove any fragments of placenta or membranes and all clots that may be in it. Then repeat the intra-uterine douche.

(8) Now choice must be made between two methods of treatment, as the adoption of one excludes the other. These are,—either to plug the uterus with iodoform gauze, or to inject perchloride of iron.

The uterus is plugged with iodoform gauze in the following manner. Seize the anterior lip with one bullet forceps and the posterior lip with another, and pass a posterior speculum if one can be obtained. Then pass a long strip of iodoform gauze up to the

fundus, by means of a plugging forceps (*v.* Fig. 163) or with the end of a Bozemann's catheter. The rest of the strip is then pushed into the uterus, taking care to pass it as far up towards the fundus as possible. If another strip has to be used, it must be knotted to the first strip in order to facilitate its extraction. It must be remembered that it is not the large cavity of a dilated uterus which we have to plug, but only the comparatively small cavity of a contracted uterus; because, on the introduction of a small quantity of gauze, the uterus, which before was flaccid and relaxed, quickly contracts firmly upon the foreign body. A tight abdominal binder is then

Fig. 163.—Curved forceps for plugging the uterus.

applied, in order to control the uterus from above, and the patient is put back to bed. The gauze is removed in twenty-four hours, and the uterus thoroughly douched out, if there is any elevation of the temperature.

The use of perchloride of iron in these cases was introduced by Barnes. He recommends that a few ounces of the Liq. Ferri Perchlor. (B. P.) be injected unto the uterus, from which all clots have been previously removed. An easier method is to add Liq. Ferri Perchlor. Fort. (B. P.) to the douche until a light sherry-coloured fluid is produced. The uterus is douched out thoroughly with this, and then with the hot creolin solution. Barnes claimed that iron acts in three ways :—

(*a*) It coagulates the blood in the mouths of the vessels.

(*b*) It constringes the tissues round the vessels, and thus compresses them.

(*c*) It provokes some contraction of the muscular wall of the uterus.

The objection to perchloride of iron is that it always causes a certain amount of superficial necrosis of the uterine wall. If saprophytic germs gain access, they have then a suitable nidus in which to lodge. Again, if iron fails to check the hæmorrhage, plugging is impossible, owing to the manner in which the tissues have become constringed. The objection to gauze is that it may not be sterile. If we can be sure that it is sterile, then plugging is much the better method of treatment. If iron is injected, the uterus must be thoroughly douched out the next day.

Compression of the aorta has also been recommended, and is undoubtedly of value if we have an assistant capable of performing it. It is of use while we are adopting local measures for checking the hæmorrhage, as it is at the uterus itself the bleeding must be finally checked.

Another method of temporarily arresting hæmorrhage is the so-called "external tamponing" of the uterus. A wide binder is applied in the ordinary manner and pinned firmly in position. It must reach from below the trochanters to above the umbilicus. The space left between it and the abdominal wall is then plugged as tightly as possible with napkins, handerchiefs, towels, etc., taking care that the fundus of the uterus is below the plug.

A third method of temporarily checking bleeding

consists in passing the fingers of one hand into the vagina, and placing them behind the cervix. The other hand is then placed on the fundus, and the whole uterus is firmly compressed between the two (*v.* Fig. 164).

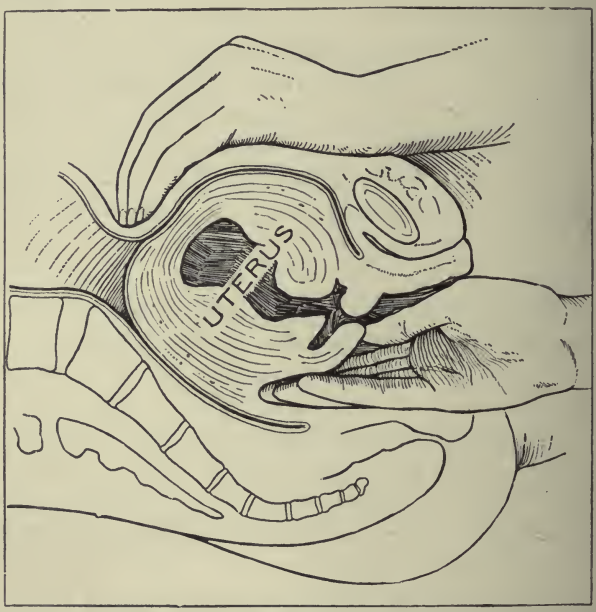


Fig. 164.—Diagram showing the method of compressing the uterus between the two hands, with the object of checking post-partum hæmorrhage.

Concealed hæmorrhage is detected by noticing the increase in size of the uterus, accompanied, if well marked, by the usual symptoms of hæmorrhage. In such cases, the uterus must be immediately emptied by expression, and, if this does not suffice, the treatment proper to external hæmorrhage is carried out.

SECONDARY POST-PARTUM HÆMORRHAGE.

Secondary post-partum hæmorrhage is the term applied to bleeding coming on more than six hours after delivery.

Ætiology.—This condition is due to separation of the thrombi in the uterine vessels, or to a congested condition of the endometrium (Lusk). The former is caused by a sudden increase in the pressure in the vessels, or by sloughing of their walls. The latter is caused by a relaxed condition of the uterus due to the retention of pieces of placenta or membranes, by malposition of the uterus, or by fæcal accumulation. Chorion-epithelioma must also be remembered as a cause of very persistent secondary post-partum hæmorrhage.

Treatment.—If the hæmorrhage is slight, free administration of ergot and expression of the clots may be sufficient. If these measures do not suffice, or if the hæmorrhage was severe from the first, a hot vaginal and uterine douche must be given, and an attempt made to determine the cause of the bleeding. If a retro-deviation of the uterus is present, it must be corrected; if a portion of placenta has been left behind, it must be removed by the fingers or a blunt flushing curette; if a vessel is found spouting in the vaginal wall or cervix it must be tied. If the bleeding still continues, the uterus must be plugged with iodoform gauze.

Post-hæmorrhagic Collapse.—When a patient is attacked by any kind of hæmorrhage, there are two chief indications for treatment:—

(1) The hæmorrhage must be checked.
(2) The collapse which threatens to follow the hæmorrhage must be staved off.

We have described how hæmorrhage may be checked; we shall now consider the treatment of the collapse. When a patient loses a quantity of blood, death threatens. This occurs, not because there is an insufficient quantity of blood in the body, but because the blood-vessels have not had time to contract to suit their capacity to the diminished quantity of blood. Blood, consequently, does not return to the heart in sufficient quantities; the latter has not sufficient fluid to contract upon; as a result, its contractions become more and more feeble, and an insufficiency of blood is sent to the brain. In consequence of this, feeble stimuli are transmitted to the heart, which fails still more, a vicious circle being thus established. Reasoning from this, we see that it is necessary to turn our treatment in three directions:—

(1) The heart must be stimulated.

(2) The diminished quantity of blood must be limited, as far as possible, to the important organs of the body, *i. e.* the brain and the viscera.

(3) The amount of fluid in the blood-vessels must be increased.

We can stimulate the patient by giving alcohol by the mouth; by the hypodermic injection of ether, strychnine, or brandy; and by the use of hot fomentations over the heart. We can keep the blood in the important organs, first, by placing blocks beneath the foot of the bed, and thus making the patient's head the most dependent part of her

body; subsequently, by bandaging tightly the arms and legs, and thus preventing blood from being wasted upon them. We can increase the quantity of fluid in the blood-vessels by giving plenty of fluid by the mouth; by administering enemata of salt and water; and by infusing saline solution directly into a vein, or into the connective tissues of the breast, axilla, or buttock.

There are no special points in the above treatment which call for description, except the method of infusing saline solution. The apparatus required for this purpose is very simple. It consists of:—a small metal funnel which holds about three ounces (85 c.cs.); a rubber tube of about three feet (90 cm.) in length; a small silver cannula; a scalpel; a dissecting forceps; small needles; needle-holder; and fine silk or catgut. The solution used is made by adding a teaspoonful of salt to a pint of water (3·36 grms. to 568 c.cs.). If possible it must be sterilized by boiling, and must be used at a temperature of 100° F. (37·8° C.). If adrenalin, or any other reliable preparation containing suprarenal extract, is at hand, some should be added to the saline solution, as it promotes contraction of the arterioles, and so helps to raise the blood-pressure. If adrenalin is used, from three to four drachms of the usual solution (1 in 1000) should be added to each pint of water.

The operation itself is as follows:—Tie a bandage round the upper arm sufficiently tightly to compress the veins, but not the arteries. By this means the veins are made to stand out, and a suitable one can be selected. Expose the latter by means of an incision about an inch in length made over it, isolate

a very small portion, and then slip two ligatures beneath it. The distal ligature is tied to prevent hæmorrhage, the vein is opened by a longitudinal incision sufficiently long to admit the cannula, and the cannula is introduced. Next tie with a single turn the proximal ligature, in such a manner that the vein is compressed against the cannula, in order to prevent the escape of the solution, and remove the bandage which was compressing the arm (*v.* Fig. 165).

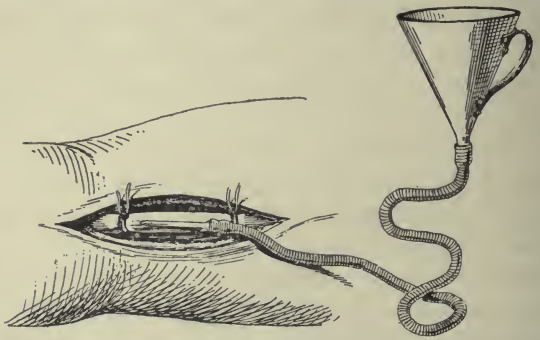


FIG. 165. – Apparatus, and method of inserting cannula, for intravenous infusion of saline solution (diagrammatic).

Before the cannula is introduced, the entire apparatus must be filled with saline solution, in order to prevent the possibility of the injection of air.

The fluid is now allowed to flow, an assistant taking care that the funnel is always filled with solution. As many as five, six, or even more pints may be injected in severe cases. By holding the funnel from ten to eighteen inches above the patient, the necessary pressure is obtained. When sufficient fluid has been injected, as shown by an increase in the volume and strength of the pulse, the cannula is removed, the

second ligature tied tightly, the vein cut across, and the skin wound stitched up with a continuous suture.

Infusion into the cellular tissue has been recommended by many writers as a substitute for intravenous infusion, on account of the greater ease and rapidity with which it can be performed. The cellular tissue below the breast is well suited for the purpose, as it is easily reached, and has a considerable capacity. In hospitals, graduated bottles, suspended above the patient's bed, are used to hold the saline solution. In private practice, a carefully sterilized jug and a syphon douche may be used. A head of about three to five feet (91·5–152·5 cms.), is required to make the fluid run. To perform the operation, a long and slender aspirating needle is fastened to the end of the douche tube ; the breast, after careful cleansing, is lifted as far as possible off the chest wall ; and the needle is passed deeply into the sub-mammary tissue, taking care to avoid the gland tissue. The fluid is then allowed to run. As soon as no more fluid will run, the needle is withdrawn, and a piece of strapping fastened over the opening to prevent any escape. Each breast will hold about a pint and a half or two pints (852–1136 c.cs.), and the time required to infuse that amount is from fifteen to twenty minutes. Both breasts can be infused simultaneously.

Rectal injections of saline solution may also be given. The fluid should be introduced slowly, as otherwise it may act as an enema and be expelled. Rectal injections of strong black coffee, to which half an ounce of whiskey or brandy have been added, may also be given.

A patient, who has had severe hæmorrhage, must not be considered as out of all danger once she has rallied from the primary collapse. The resulting enfeeblement of the circulation carries with it many dangers. The most common of these are cardiac syncope, coming on as the result of some sudden exertion; pulmonary embolus, due to the detachment of a thrombus whose formation has been favoured by the weak action of the heart; crural phlegmasiæ, from a like cause; and an increased risk of septic infection, owing to the lowering of the natural resistance offered by the system to bacterial invasion.

We shall conclude this chapter with a well-known remark: "Your patient should not be allowed to die of post-partum hæmorrhage."

CHAPTER XXVII.

GENITAL INJURIES.

Hæmatoma of the Vagina and Vulva—Inversion of the Uterus—Rupture of the Uterus—Laceration of the Cervix—Laceration of the Perinæum.

HÆMATOMA OF THE VAGINA OR VULVA.

Hæmatoma of the vagina or vulva is the term applied to a collection of blood in the areolar tissues about the vagina or vulva (*v.* Fig. 166).

Frequency.—At the Rotunda Hospital, amongst 25,790 patients, the relative frequency of hæmatoma of the vagina or vulva was 1 in 1842·14, *i. e.* 0·05 per cent.

Ætiology.—As the head descends through the vagina, the return flow of blood through the veins is obstructed, and so the intra-venous pressure is increased. Rupture of a vein may then result. Venous rupture due to laceration of the submucous tissues of the vagina or vulva may also occur, as a result of undue stretching of the tissues by the presenting part of the fœtus.

Varicosities of the vulvar or vaginal veins do not appear to predispose to this condition.

Symptoms.—The condition commences with the formation of a small tumour, elastic to the touch and of a blue colour, which gradually increases in size. The vein may rupture before or after delivery, but usually the condition is not noticed until after delivery. The other symptoms are pain and collapse, both being in proportion to the size of the tumour.

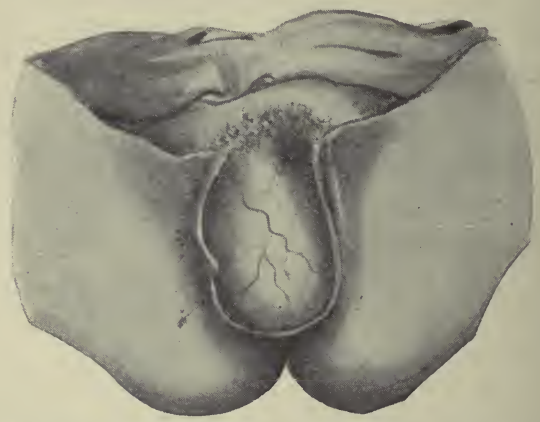


Fig. 166.—Hæmatoma of the left labium. The arrow points to the entrance to the vagina. (Drawn from life.)

Terminations.—The case may terminate in four ways if the condition remains untreated :—

(1) The tumour may rupture and free externa hæmorrhage result.

(2) The hæmorrhage may extend interstitially upwards towards the abdomen, or downwards towards the perinæum, according as the ruptured vessel is above or below the deep perinæal fascia. The patient may thus "bleed to death into her subcutaneous tissue."

(3) The tumour if small may be absorbed aseptically.

(4) Suppuration or decomposition of the contents of the tumour may occur.

Treatment.—If the hæmatoma occurs before delivery, deliver at once. It will usually be possible to apply forceps. If the tumour obstructs delivery owing to its size, it must be incised, its contents turned out, and the child delivered past it as rapidly as possible. If the tumour increases in size after delivery, and pressure fails to check the increase, it must also be opened, and its contents turned out. In any case in which incision is practised, the cavity should be douched out, and then plugged tightly with iodoform gauze. The plugging is changed every day until the cavity is obliterated. If the cavity is not very large, it may be possible to close it by means of deep sutures passed beneath it.

If the tumour is very small, and is not increasing in size, it may be left to absorb. Suppuration should not occur; if it does occur, the abscess must be opened at the spot at which it points, and free drainage permitted.

Prognosis.—The prognosis depends upon the treatment adopted. The patient may die of hæmorrhage or of sepsis. Neither should occur if the case is correctly treated.

INVERSION OF THE UTERUS.

Acute inversion of the uterus is one of the rarest accidents met with in midwifery. The uterus becomes partly, or completely, turned inside out, so that the fundus appears through the cervix.

Ætiology.—Inversion is liable to occur in the case of a large and lax, thin-walled uterus. It has been caused by :—

(1) Dragging on the placental site by means of the cord while the placenta is still adherent.

(2) Violent straining associated with sudden emptying of the uterus, *e. g.* precipitate labour, and severe straining and pressure in the removal of the after-birth (Winckel).

Symptoms.—The occurrence of inversion is usually followed immediately by the extreme collapse of the patient ; more rarely the collapse does not come on for some hours. There may or may not be severe hæmorrhage.

Diagnosis.—If the hand is placed upon the abdominal wall, the absence of the fundus of the uterus from its usual position will be readily determined. If a careful examination is made, it may be possible to determine the existence of a cup-shaped depression corresponding more or less exactly to the former position of the upper part of the cervical canal. At the same time the vagina is found to be occupied by a globular tumour to which the placenta may or may not be attached. The diagnosis is then at once obvious. If the inversion is only partial, the non-inverted portion of the body of the uterus will be felt with a similar cup-shaped depression in its centre.

Treatment.—If the placenta is still adherent, it should be removed and the uterus immediately replaced by the hand. To do this, the uterus is grasped in the hand and pushed gently upwards, endeavouring to return first the part which came down last.

The uterus is then thoroughly douched with creolin solution, and is plugged with iodoform gauze to promote contraction, and to prevent a possible return of the inversion.

RUPTURE OF THE UTERUS.

Rupture of the uterus may occur at any stage of labour. It is a rare accident, but is perhaps not quite so rare as is usually believed. Any portion of the uterus may rupture, but, with a very few exceptions, the rupture always commences in the thin lower uterine segment (*v.* page 134) (*v.* Figs. 167 and 168). Starting there, it may extend in any direction —upwards towards the fundus, downwards towards the vagina, or circularly round the uterus. In the last case, the entire lower uterine segment may be torn off. A distinct variety of rupture, viz. rupture by attrition—or rubbing through—of a portion of the uterine wall, is sometimes met with. This particularly happens in cases of flattened pelvis, where the uterus may become caught between the descending head and the promontory of the sacrum. In these cases a circular hole may be rubbed through the wall of the uterus; or, more commonly, perhaps, the vitality of the compressed portion may be so destroyed that it sloughs away after delivery. There are two degrees of rupture :—

(1) *Complete,* when the laceration extends through the uterine wall and the investing peritoneum.

(2) *Incomplete,* when the peritoneum is intact,

and there is no communication between the uterus and the peritoneal cavity.

Ætiology.—The chief causes of ruptured uterus are :—

(1) Obstructed delivery from any cause, as,—contracted pelvis, cross-births, hydrocephalic head, tumours blocking the pelvis, etc.

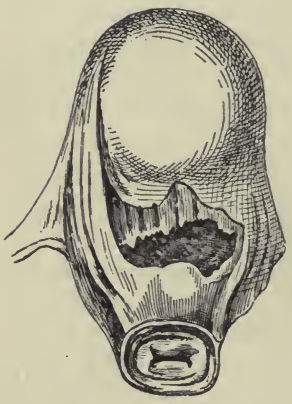


Fig. 167.—Rupture of the thinned lower uterine segment. (Spiegelberg.)

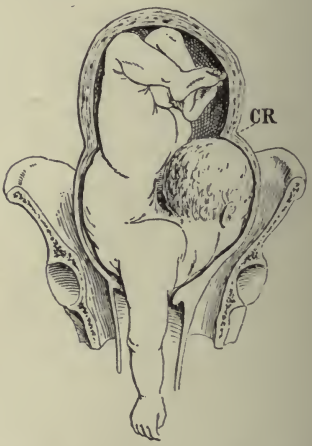


Fig. 168.—Thinning of lower uterine segment in a case of obstructed delivery. CR. —Retraction ring. (Modified from Schroeder.)

(2) Fatty degeneration of the uterus.

(3) A weak cicatrix resulting from a former Cæsarean section.

(1) In obstructed delivery, rupture always commences in the lower uterine segment, because, as a result of the retraction of the muscle-fibres, the fundus becomes thicker at the expense of the lower

uterine segment, which consequently becomes progressively thinner and weaker as labour continues (*v.* page 134).

(2) In fatty degeneration, rupture may occur in any part of the uterus. It may occur at the commencement of labour, and cannot be foreseen.

(3) The cicatrix of a former Cæsarean section may rupture during a subsequent labour, if it has not united firmly.

Symptoms.—It is best to consider the symptoms of rupture of the uterus under three heads, viz. :—

(A) Threatened rupture.
(B) Sudden rupture.
(C) Gradual rupture.

(A) **Threatened Rupture.**—The symptoms of threatened rupture of the uterus are :—a rising temperature—above 101° F. (38·3° C.) ; an increasing pulse rate—more than 110 per minute ; continuous or tonic uterine contractions ; the retraction ring felt more than one and a half inches (4 cms.) above the symphysis ; ballooning of the vault of the vagina ; standing out and tenseness of one or both round ligaments.

(B) **Sudden Rupture.**—The symptoms of sudden rupture are :—a sensation as if something had burst internally ; cessation of labour pains ; recession of the presenting part, unless it is already fixed ; collapse, rapid pulse, falling temperature, all in proportion to the amount of hæmorrhage that is occurring ; and intense pain over the abdomen. These are the classical symptoms, but any or all of them may be absent.

(C) **Gradual Rupture.**—This is the commonest

manner in which rupture occurs, and its symptoms are ill-defined. Nothing abnormal may be noticed until the time comes to remove the placenta, when, upon introducing the hand into the uterus, the rent is discovered. If there is hæmorrhage, there will, of course, be the symptoms of collapse. If rupture is so extensive that the child escapes into the abdomen, the empty uterus may be felt by abdominal palpation lying tightly contracted at the pelvic brim, and the fœtal parts will be felt with unusual distinctness.

Treatment.—The treatment is prophylactic or curative, as the case may require.

Prophylactic Treatment.—The prophylactic treatment consists in correcting malpresentations of the child or obliquity of the uterus, and in immediate delivery if the indications of threatened rupture appear. If the anterior lip descends in front of the head, and becomes caught between the latter and the symphysis, it must be pushed above the convexity of the head, and kept there during a pain. It will then remain up of itself.

Curative Treatment.—The curative treatment depends entirely upon the condition of affairs present. If the child is undelivered when the rupture is diagnosed, it must be delivered at once. If it is in the uterus, perforate the head and extract it; if it has escaped into the abdomen, cœliotomy is necessary. If there is much hæmorrhage from the laceration, the uterus must be removed. If the child is already delivered before the rent is noticed, the treatment to be adopted depends upon the amount of hæmorrhage. Remove the placenta, and, if there is no hæmorrhage

to signify, pass a strip of gauze through the rent, so as to allow drainage. No further treatment is necessary. The gauze should be removed in twenty-four hours. If there is much hæmorrhage, abdominal cœliotomy followed by the removal of the uterus is indicated. The most suitable form of hysterectomy in these cases is supra-vaginal amputation of the uterus by Kelly's method, or possibly panhysterectomy may be preferred.

Dangers.—The dangers of rupture of the uterus are :—

(1) Hæmorrhage.
(2) Sepsis.

If the former occurs, it must be treated as described. The latter will not occur in a healthy patient, if all due aseptic precautions have been taken.

LACERATION OF THE CERVIX.

Lacerations of the cervix are seldom recognised unless they cause hæmorrhage. Their treatment in that case is described under post-partum hæmorrhage (*v.* page 464).

LACERATION OF THE PERINÆUM.

This is one of the commonest accidents occurring in midwifery. It occurs far more frequently than is supposed ; as, unless it is looked for with care, it may not be noticed. There are two degrees of laceration of the perinæum :—

(1) *Complete,* where the laceration extends right through the perinæal body into the rectum.

(2) *Incomplete,* where the laceration involves the perinæal body alone.

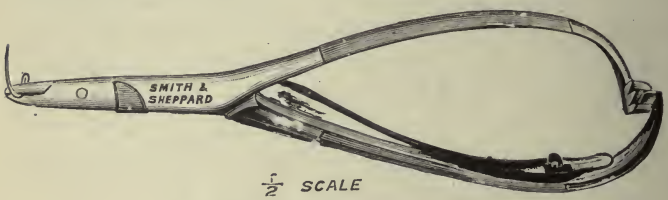


Fig. 169.—Doyen's needle-holder.

Lacerations of the perinæum must be sutured immediately after they occur, for two important reasons :—

(1) To prevent the formation of a puerperal ulcer (*v.* page 494).

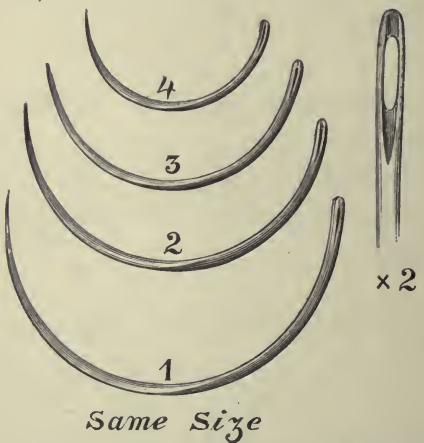


Fig. 170.—Whole-curve needles ; large, medium, and small.

(2) To guard against future prolapse of the uterus. A deep laceration of the perinæum almost always involves the levator ani muscle, and, if this

remains ununited, the anterior vaginal wall has lost its support, and the integrity of the floor of the pelvis is destroyed.

Instruments.—The following instruments are required :—Needle-holder (*v.* Fig. 169) ; silk-worm gut

Fig. 171.—Complete laceration of perinæum with continuous catgut suture in rectal and vaginal tear. (Modified from 'The Norris Text-book of Obstetrics.')

or catgut sutures ; large and medium-sized whole-curve needles (*v.* Fig. 170) ; and a pair of scissors.

Operation.—The operation for a complete laceration is as follows :—The first step consists in turning the complete laceration into an incomplete laceration, by suturing the rent in the anterior rectal wall This may be done, if the rent is small—up to half an

inch in depth—by means of a purse-string suture which runs round the laceration. If the tear in the rectal wall is large, it is better to suture it from above downwards with a continuous catgut suture (*v.* Fig. 171). This suture takes up the rectal wall, with the exception of the mucous membrane, at each

Fig. 172.—Complete laceration of perinæum turned into an incomplete laceration by suturing rectal tear. Continuous suture in vaginal wall, and perinæal sutures in position. (Modified from the 'The Norris Text-book of Obstetrics.')

side, and so brings together the torn edges of the rectum. As soon as this is done, the suture is continued from below upwards, and this time takes up the torn surfaces of the perinæal body. When the upper angle of the tear is reached, the suture is continued again downwards, and this time takes up the vaginal mucous membrane. Finally, the torn edges of peri-

næal skin are brought together by stitches passed from the external aspect of the perinæum. They are entered at the side of the laceration, passed almost to the bottom of it, and brought out at the corresponding point upon the other side. They must be tied from behind forwards, and incomparably the best material to use is silkworm gut, as it does not absorb discharge.

If the laceration involves the perinæal body only, and does not extend far up the vaginal mucous membrane, interrupted perinæal sutures will be sufficient; but, if the laceration extends for any considerable distance up the posterior vaginal wall, the edges of the latter must be stitched separately with a continuous catgut suture, the stitches being passed from the vagina (*v* Figs. 171 and 172). If the torn edges of the levator ani muscle are exposed, they should be brought together by buried catgut sutures before passing the perinæal sutures.

After-treatment.—The wound must be kept as dry as possible during the puerperium. It should be washed regularly night and morning, dusted with boracic powder, and covered with a sterilised dressing. It should also be bathed and powdered after the patient passes water. In the case of a complete laceration, the bowels may be kept confined until the fourth or fifth day, and then it is well to give an olive oil enema, as well as a purgative, in order to ensure that the fæces are soft. In all cases the stitches should be removed on the eighth day, unless they are catgut, which is absorbed.

CHAPTER XXVIII.

SAPRÆMIA AND SEPTIC INFECTION.

Varieties—Sapræmic Infection: Ætiology, Symptoms, Prognosis, Treatment—Septic Infection: Ætiology, Consequences—Local Septic Infection: Symptoms, Treatment—General Septic Infection: Varieties—Lymphatic Sepsis: Symptoms, Prognosis, Treatment, Antistreptococcic Serum—Pyæmia: Ætiology, Symptoms, Prognosis, Treatment.

Invasion of the genital tract by pathogenic bacteria manifests itself, during pregnancy or the puerperium, in two distinct forms:—

I. Sapræmia.
II. Septic infection.

I. SAPRÆMIA.

Sapræmia is the condition of intoxication resulting from the absorption of the poisons produced by putrefactive decomposition. If air gains admission into the vagina or uterus during or subsequent to the third stage of labour, saprophytic organisms may be carried in along with it. They lodge in any dead matter, as blood-clots or portions of placenta, and there generate ptomaines. In some cases the latter are expelled as fast as they form, and give rise to

few symptoms; but, in other cases, where there is an obstruction to their escape, they are absorbed by the patient, and sapræmia, or sapræmic intoxication, results. If the decomposing matter is allowed to remain in the uterus, the endometrium is attacked and a putrid endometritis results.

Ætiology.—Sapræmic infection is the result of the association of two factors, first the entrance of saprophytic organisms, and secondly the presence of dead or necrosing matter in the genital tract, on which these organisms can live. Saprophytic organisms are probably carried into the genital tract in the air, and anything that facilitates the entrance of air directly increases the number of organisms that gain admission. As definite causes of air entrance may be mentioned the introduction of the hand or of instruments after delivery, and the lateral position of the patient during the third stage. Saprophytic organisms may also gain admission by the direct upward extension of an external decomposition. Improper management of the third stage of labour, *i. e.* premature expulsion of the placenta and the consequent retention of fragments, is the common cause of the presence of dead matter in the uterus. Prolonged labour by causing crushing and so necrosis of the soft parts, the insufficient control of the fundus by allowing the uterus to fill with clots subsequent to the expulsion of the placenta, and the retention of the lochia in the uterus and vagina, are also well-recognised causes.

Symptoms.—The symptoms of sapræmic infection are of two kinds,—constitutional and local. The constitutional symptoms are the result of the absorp-

tion of ptomaines, the product of the decomposition; while the local symptoms are due to the presence of decomposing matter in the genital tract, and to the effect of this decomposition on the surrounding tissues. The constitutional symptoms set in from the third to the fifth day after the birth of the child, and usually commence gradually. The temperature rises to 101° or 102° F. (38·3°–38·8° C.), and the pulse becomes proportionately rapid. If the case is treated, these symptoms disappear; otherwise the temperature rises higher on the following night, and the patient may have a slight rigor. If the case is still untreated, the symptoms become very much more marked, the patient feels very ill indeed, and, in exceptional cases, may die as a result of what is practically ptomaine poisoning. More usually, however, the local symptoms are more marked than the constitutional symptoms. The first local symptom to appear is a fœtid condition of the lochia, which change from the normal sero-sanguineous discharge to an offensive fluid that is abundant, and sometimes frothy owing to the presence of gas-producing bacteria. The stain, which such lochia leave upon the sheet or diaper, also is changed. Healthy lochia cause a stain resembling that left by a drop of blood. It is deep red in the centre, and fades away gradually into a purely serous margin. Putrid lochia cause an exactly opposite variety of stains, which has a hard, deeply stained edge, and the colour fades slightly towards the centre.

If the intra-uterine decomposition continues, the uterine wall is in turn invaded by the putrefactive organisms. It is probable that bacteria, which at

the onset were saprophytic, and so were only able to live upon dead matter, can, under suitable conditions, become pyogenic and capable of developing upon living tissues. These suitable conditions occur in the case of a neglected sapræmia. Consequently, the bacteria which have gained in virulence by growing on portions of placenta and clots, now attack the uterus itself and cause a putrid endometritis. The chief symptom of this condition is a very foul-smelling and profuse discharge coming from a subinvoluted uterus.

In such cases the uterine wall is covered by a thick layer of necrotic material, which contains swarms of the invading bacteria. Under this layer lies a thick zone of small-celled infiltration, and below this again lies unaffected uterine muscle. The bacteria are almost entirely limited to the superficial necrotic layer, and, in this respect, as will be presently seen, contrast markedly with septic endometritis (*v.* page 501). The subsequent course of cases of pure saprophytic infection does not appear to have been clearly determined. Doubtless, in the majority of cases, the superficial necrotic layer is gradually detached and expelled in the lochia, and recovery results. In other cases, the patient may die of ptomaine poisoning, and, in still other cases, pyogenic organisms may effect an entrance and a mixed infection result. In such cases the subsequent history of the case is that of septic endometritis. It is doubtful, however, whether a pure saprophytic infection ever extends beyond the uterus, and gives rise to parametritis, tubal infection, or peritonitis. It may do so, but it is more probable that, in those

cases in which it appears to have done so, the infection was in reality a "mixed" septic and saprophytic infection. A pure saprophytic infection is a comparatively rare occurrence.

A frequent concomitant of sapræmic infection of the genital tract is the condition known as *puerperal ulcer*. This is an ulcer of varying size, with a grey sloughing base and an inflamed margin. It forms on lacerations of the genital tract, and causes a profuse foul discharge, accompanied by a rise of temperature and other slight constitutional disturbances. Sometimes it is found as the sole consequence of sapræmic infection, the uterine cavity having escaped.

Prognosis.—If sapræmia is treated in time, the patient almost always recovers. If the condition is untreated, she may die from ptomaine poisoning, or, in the case of a "mixed" infection, from pyæmia. If extension of the infection to the tubes takes place, she may die of septic peritonitis; and, even in the most favourable cases, she will be an invalid for a long time, and perhaps for life.

Treatment.—The prophylactic treatment of sapræmia consists in the proper management of the third stage of labour, and in the maintenance of vaginal asepsis during the puerperium. If sapræmia occurs, it must be treated at once. When the symptoms first appear, raise the head of the bed slightly, and so favour free drainage from the vagina. With the same object, administer a purgative, which, by causing bearing-down efforts, assists in emptying the vagina. If the third day has passed, the patient may be allowed to kneel up in bed when passing water. If, in spite of this treatment, the tempera-

ture still keeps high, she must be given a copious douche of hot cyllin or lysol solution (1 in 320). If the decomposition is limited to the vagina the douche may be similarly limited, but if, as is usually the case, there is reason to think that the uterus also is affected, a vaginal and a uterine douche should be given. The vaginal douche may be given with a glass nozzle, but for the uterine douche a large-sized Bozemann's catheter should be used in order to permit of free return of the fluid. In the great majority of cases the temperature will now fall. If it still remains high, the uterus must be douched twice daily.

There are two other germicides from which we should be disposed to expect good results, namely formalin and peroxide of hydrogen. Formalin may be used at a strength of from ten to fifty per cent., and should be injected directly into the uterine cavity, to prevent it from coming into contact with lacerations of the vagina or cervix, and then should be washed away as soon as it has acted for the required time. If it is used at a strength of fifty per cent. it should not be allowed to act for more than thirty seconds, but, if used weaker, it may act for a proportionately longer time. If it causes pain, it must be washed away immediately, and so, when it is about to be injected, the operator must have a douche and Bozemann's catheter ready for immediate use. Peroxide of hydrogen may be used at a strength of from thirty to fifty per cent., and may be added to the douche, or directly injected into the uterus. On meeting with the decomposing lochia, oxygen is set free and effervescence occurs. The

peroxide should be slowly injected until effervescence ceases.

If the discharge remain foul in spite of two or three intra-uterine douches, the uterus should be carefully curetted with a blunt Rheinstädter's douche curette, in order to remove any portion of placenta or of membrane which has been left behind. The curetting should be thorough, but the greatest care must be taken that the uterus is not perforated. If it is obvious that the inflammation has extended to the tubes, curetting is contra-indicated. There is always a slight risk that this operation may set up pyæmia in the case of a mixed infection, but the advantages gained from it more than counterbalance this risk. It must, however, be so carried out that the curette only brings away fragments of placenta and decidua adhering to the uterine wall; that is to say, it must be done with a very light hand. If the curette is pressed forcibly against the uterine wall, it is quite possible to bring away portions of the softened uterine wall, a procedure which is most inadvisable, both because it removes tissue which ought not to be removed, and because it opens up fresh paths by which a mixed infection can travel beyond the uterus.

If a fœtid discharge continues even after the curetting, great benefit may be obtained by the use of iodoform gauze. Plug the uterus night and morning as tightly as possible, after first douching it out thoroughly, and curetting it gently if thought advisable. This method of treatment should be followed until decomposition has ceased. The treatment of those cases in which the infection extends

beyond the uterus, and in which we are in all probability dealing with a mixed infection, will be discussed later (*v.* page 503).

If a puerperal ulcer forms, and there is no reason to suspect infection of the uterine cavity, the treatment is at first purely local, and consists in the careful washing away of all discharge and in the application of iodoform powder to the ulcer. Vaginal douching is contra-indicated, unless the vagina or uterus is also infected, lest the putrid discharge should be carried up into the uterus. Instead, it is better to raise the head of the bed and so favour free drainage. If the ulcer is situated in the vagina, the latter may be plugged twice daily with iodoform gauze. If it becomes necessary to douche, a very low pressure of water should be used.

In all cases the patient must get plenty of nutritious and digestible food. While the temperature is high, alcohol may be given in doses of from four to ten ounces, or more, in the day, in accordance with the severity of the case. The free use of ergot is also advisable, as, by promoting contraction of the uterus, it assists in expelling clots and lochia, and at the same time hinders absorption. One or two drachms of the liquid extract may be given night and morning.

II. SEPTIC INFECTION.

Puerperal septic infection is the result of the invasion of the genital tract by pyogenic organisms. It is one of the most serious diseases to which pregnant women are liable. In the past it was the cause of the high rate of mortality which prevailed in lying-

in institutions, and though at the present time the practice of asepsis and the use of antiseptics have banished it, to a very great extent, from properly managed hospitals, still in private practice it is a great deal too common. As will be seen, it may assume various forms, but in all cases it commences as a local infection, the direct result of the introduction of pyogenic bacteria into the genital tract.

Ætiology.—Septic infection in childbirth, or "puerperal fever," as it was formerly termed, was, for many years, regarded as a specific disease peculiar to lying-in women, and was attributed to many and various causes, which were as a rule characterised by their indefinite nature. One of the earliest notions attributed it to the retention of lochia, and this theory held the field for many centuries. In more recent times, other notions were held regarding its ætiology, and it was variously attributed to "the metastasis of milk to the womb," to climatic and atmospheric influences, to the influences of locality, to emotional causes, and to the "act of God."

Semmelweiss was the first to draw attention to its true nature, and the theories which he laid down on clinical grounds have been subsequently confirmed and placed on a sure basis by the scientific work of Lister and Pasteur. It is now definitely established and universally accepted that the "puerperal fever" of former days is due to an infection of the genital tract by septic organisms, and that it is identical in every particular with the septic infection of wounds.

The following bacteria, as far as we at present know, are the principal causes of septic infection during parturition:—*Streptococcus pyogenes, Staphy-*

lococcus aureus, Gonococcus, Bacillus coli communis, and the *Bacillus diphtheriæ.* The first three are considerably the most common, and one or more of these forms are present in almost every case of septic infection.

We have already referred to the usual manner in which these organisms obtain access to the genital canal (*v.* page 3), namely, on the hands or instruments of the obstetrician or midwife. A few rarer modes in which infection can be introduced must now be mentioned. In local septic conditions of the vulva or vagina, bacteria may reach the uterine cavity by direct extension, or may be carried up on the fingers or in douches. The patient may herself introduce bacteria by passing her fingers into the vagina. Coitus during the last few days of pregnancy, or shortly after delivery, may be responsible, and in such cases the infection is not infrequently gonorrhœal.

Consequences of Infection.—In all cases, the infection is at first a local one, and commences either in the vagina or in the uterus. Its subsequent course depends upon the nature and the virulence of the infecting bacteria, and the powers of resistance of the patient. If the virulence of the bacteria is of low degree, the infection is at first limited to whatever part of the genital canal was inoculated, or extension may take place locally—to the tubes, the pelvic cellular tissue, and the pelvic peritoneum, and in the case of a more virulent infection, to the general peritoneal cavity. In some cases the local infection remains the serious and prominent feature of the case, and according to its extent and severity

the patient may gradually recover or may die; but, in other cases, the local trouble is only the starting point from which bacteria may subsequently extend into the circulation of the patient, and give rise to a general infection. If, on the other hand, the virulence of the infecting bacteria is very great, the local effect of the infection may be so slight as to escape notice, and the bacteria may pass almost directly into the circulation of the patient and give rise to a general infection.

Accordingly, we see that septic infection occurs in two different forms. These are:—

(A) As a local infection, in which the symptoms of the patient are due to the local infection of one or more of the pelvic structures, or of the general peritoneal cavity.

(B) As a general infection, in which the symptoms of the patient are due to the entrance of bacteria into the general circulation.

LOCAL SEPTIC INFECTION.

Local septic infection of the genital tract is the most common form in which puerperal septic infection manifests itself. Pyogenic organisms are carried into the uterus and lodge in the placental site or in some laceration which has occurred in the cervix or vagina. From here they may extend to the surrounding structures or to the general peritoneal cavity.

When the placental site is infected, the remainder of the uterine cavity is usually rapidly involved, and a septic endometritis results. When a laceration

of the cervix or vagina is alone attacked, a septic form of puerperal ulcer results, or, more rarely, a general septic vaginitis.

The condition of the uterine wall in septic endometritis differs markedly from its condition in putrid endometritis (*v.* page 493). The necrotic layer, with which the inside of the uterus is covered, is thinner than that found in association with sapræmic infection. The zone of small-celled infiltration is very thin, and is sometimes almost absent, while the infecting bacteria, which in putrid endometritis are altogether superficial to this zone, in septic endometritis are found both in the zone itself, beneath it amongst the uterine muscle, and in some cases even in the peritoneal coat. The more acute and virulent the infection, the less marked are the uterine changes until, in a virulent streptococcic infection, the uterine wall is practically unaffected, although invaded in all directions by the infecting organism.

If the infection remains limited to the uterus or the vagina, the acute inflammation gradually passes into a chronic one, which may persist for a long time. On the other hand, the infection may pass beyond the uterus, either by travelling directly through the uterine wall to the parametrium or the peritoneum, or through the tubes to the peritoneal cavity. If the parametrium is infected, a cellulitis results, which may extend right round the uterus or may be limited to one or other side. In such cases a serous exudate is poured out into the parametric tissues, and this can be felt as a hard mass in which the uterus is apparently embedded. In some cases, the infection is gradually overcome and the exudate is absorbed,

but, in other cases, an abscess forms, which may burst into any of the neighbouring viscera, into the peritoneal cavity, into the vagina, or externally.

If the tubes are infected a septic salpingitis results, and in many cases the infection extends onwards into the peritoneal cavity. Here, as a rule, an adhesive peritonitis glues the pelvic peritoneum together, and prevents the extension of infection beyond the pelvic cavity. This is the commonest termination of such cases, and is the cause of subsequent adherent retro-deviations, fixed ovaries, and pyosalpinx. If, however, the virulence of the infecting organism is considerable, extension may occur before adhesions have time to form, and a general septic peritonitis results.

The most serious consequence, which may follow septic endometritis, is the infection of the thrombi in the uterine sinuses, as, if an infected thrombus breaks down in the sinus, the particles set free in the blood-stream will be carried to other parts of the body and a general pyæmic infection result.

Symptoms.—The symptoms of a septic endometritis are both local and general. The local symptoms are like those of putrid endometritis, and are in inverse proportion to the virulence of the infecting organism. If the virulence is very great, the local symptoms are slight. If, on the other hand, the virulence is less, the local symptoms are well marked in correspondence with the changes which have occurred in the uterus. The lochia are altered from a serosanguineous or serous fluid to one consisting partly of blood and partly of pus. The quantity is not increased unless there is an accompanying sapræmic in-

fection, in which case the lochia are fœtid, and contain shreds of necrotic mucous membrane, and endometrium. The uterus ceases to involute, and is large, soft, and sometimes extremely tender. If the vagina is also infected, the vulva is swollen and inflamed. The constitutional symptoms are in direct proportion to the virulence of the infecting organism, and consist in an elevation of the temperature to 104° F. (40° C.), or even higher, a proportionate increase in the pulse rate, general malaise, and the occurrence of one or more rigors.

The extension of the infection beyond the uterus is shown by the occurrence of intense pain over the lower part of the abdomen, by a further rise in the temperature and pulse-rate, and by rigors. The severity of the pain is proportionate to the formation of adhesions, and in those cases in which a general infection of the peritoneal cavity occurs, pain may be almost or entirely absent. Its occurrence, therefore, is a favourable sign, as showing the limitation of the infection. The presence of inflammatory exudates, or of collections of pus in the tubes or pelvic cavity, can be determined by bimanual examination, and by palpation of the lower part of the abdomen.

Treatment.—The treatment of septic endometritis is very similar to that of putrid endometritis, except that, if we know the case to be one of pure pyogenic infection, curetting is not so clearly indicated, as the risk of opening channels through which the infection can extend beyond the uterus is considerable. It is, however, difficult, and in many cases impossible, to determine the exact nature of the infection, although, if possible, a bacteriological

examination of the lochia should be made. Under such circumstances, the best course appears to be to explore the inside of the uterus with the finger, in order to determine the condition of the endometrium. If the latter is very rough, and covered with a necrotic lining, it is probably better to curette, especially if the lochia are fœtid. If, however, the inside of the uterus is apparently unaffected, it is better not to curette, but to content ourselves with copious douches and with plugging the cavity with iodoform gauze. Formalin may also be injected into the uterus, as has been described (*v.* page 495). In all cases it is well to administer ergot freely to promote uterine contraction. In septic conditions of the vagina, the canal should be plugged with iodoform gauze twice a day, and any ulcers dusted over with iodoform powder.

If the infection extends beyond the uterus, pain must be relieved by hot stupes and by hypodermic injections of morphia. The patient should be freely purged, and her strength well maintained with fluid nourishment. Hot vaginal and uterine douches may be given frequently. If an abscess forms, it must be opened at once, and in such a manner as to avoid infection of the peritoneal cavity. If a general septic peritonitis occurs, the only treatment which offers any prospect of saving the life of the patient is abdominal cœliotomy and the flushing out of the peritoneal cavity with normal saline solution, followed by drainage, if possible both through the vagina and through the abdominal wall.

GENERAL SEPTIC INFECTION.

General septic infection is the result of the invasion of the circulatory system by pyogenic bacteria, which gain entrance through the lymph stream or through the veins, and tend to cause the death of the patient either by the toxins which they generate, or by setting up inflammatory processes in vital organs. It is divided according to the path by which the bacteria reach the system, into:—

(A) Septicæmia or lymphatic sepsis.

(B) Pyæmia or venous sepsis.

Lymphatic Sepsis.

Septicæmia or lymphatic sepsis is the term applied to the condition that results from the entrance of pyogenic bacteria by way of the lymphatics into the circulation of the patient. It is the most fatal disease to which puerperal women are liable, and is due to the inoculation of some part of the genital tract with a virulent form of *Streptococcus pyogenes*. According to the degree of virulence, the streptococci may pass directly into the lymph channels without giving rise to any local changes, or a local change, such as septic endometritis, may first occur, and then extension into the lymph channels follow.

Symptoms.—The symptoms appear from twenty-four to fifty hours after inoculation. They are usually ushered in by a severe rigor, during which the temperature rises to 104° F. or 106° F. (40°–41° C.). The pulse is exceedingly frequent, and is even out of proportion to the temperature. The rigor may or

may not recur; the patient is at first bathed in a profuse cold sweat, but later all sweating may cease, to come on again just before death. The secretions peculiar to the puerperium, *i. e.* the lochia and milk, cease completely, if they are ever properly established. The patient looks extremely ill, and is sleepless. Her face is pinched, and has a sub-icteric tinge; the angles of the mouth and nose are drawn down; and the eyes appear sunken into the head. A very common symptom is extreme depression. In some of the worst cases, however, the patient may say that she feels extremely well, and may even wish to be allowed up (*v.* page 272). This condition is known as *euphoria,* and is due to the fact that the higher centres are dulled by the poison which is circulating in the system. It is a sign of the worst possible import. A frequent concomitant of the general infection of the patient is a diffuse septic peritonitis. The duration of the disease is at the most a week, frequently only a couple of days. The temperature rises during the entire time, and may reach 106° F. or 107° F. (41°–41·6° C.). Towards the last the heart fails rapidly.

Prognosis.—A short time ago the prognosis was absolutely bad, but it has been somewhat improved by the introduction of antistreptococcic serum. Formerly, if the patient recovered, it was most probable that the diagnosis was incorrect.

Treatment.—When the symptoms appear, the vagina and uterus should be douched, on the chance that the attack may be due to a local infection. If, however, the symptoms do not improve rapidly, it is useless to continue the douches. The drug that seems

to be of most avail is alcohol, and it should be pushed to the utmost extent. The patient must be given literally as much as she can be urged to take, and this is rarely more than sixteen to twenty ounces in the twenty-four hours. Strychnine may also be given, either hypodermically or by the mouth, with the object of maintaining and strengthening the action of the heart. Extreme elevation of temperature must be treated by sponging with cold or iced water. Chemical antipyretics are, as a rule, useless. Good results have been obtained by the subcutaneous injection of normal saline solution. From one to three pints may be injected at the time, and the injection repeated at intervals of twelve hours (*v.* page 475).

For some time past, considerable attention has been paid to the possibilities of antistreptococcic serum. Undoubtedly cases of acute sepsis have recovered under its use; but also many cases of purely sapræmic infection have been treated with it, under the belief that they were, or for fear that they might be, acute sepsis. From the fact that such cases recovered, we can deduce nothing as regards the efficacy of the serum in the graver infection.

Of late years the value of a "polyvalent" serum, that is a serum prepared from a horse which has been inoculated from several different strains of streptococcus, has been the subject of inquiry. Its value has still to be ascertained, but, at least, it may be said that, as it is impossible to ascertain the nature of the infecting strain of streptococcus in an individual case, or, even if it could be ascertained, to prepare a corresponding serum, the polyvalent serum increases the chance of successfully combating the

infection. To be of value, however, the serum must be freshly prepared, and a sufficiently large dose must be administered.

Various toxic symptoms not infrequently follow the use of anti-streptococcic serum, such as cutaneous eruptions and joint pains. These symptoms are probably mainly due to the introduction into the system of horse serum. They are transient, and, in comparison with the condition for which the serum is used, are of no importance.

If it is determined to try the serum, it is administered as follows :—A first injection of 20 c.cs.; then 10 c.cs. once or twice every twelve hours until considerable improvement is manifested. As soon as this occurs, the amount and the frequency may be diminished. When using the serum, strict precautions must be taken to ensure the asepsis of the syringe with which it is injected, and of the skin through which the puncture is made.

Other remedial measures that have been recommended are unguentum Credé and a substance known as nuclein. Unguentum Credé, as its name implies, was introduced by Credé, and contains fifteen per cent. of a silver salt called collargolum. Cases, in which apparent benefit has followed its use, have been recorded, and, as it is a simply adopted remedy, it may be tried without prejudicing the effect of other treatment. From fifteen to forty-five grains should be rubbed once or twice daily into the skin on the inner aspect of the thigh, the duration of the inunction being from fifteen to twenty minutes. The site of inunction should be then covered with rubber tissue. Another method of introducing the silver

into the system consists in the injection of soluble collargolum, dissolved in distilled water, under the skin, or into a vein. A half or a one per cent. solution is used, and, as a rule, from two and a half to five drachms of the former, or from a drachm and a quarter to two drachms and a half of the latter are injected.

Nuclein is a substance obtained from yeast, and is said to cause an artificial leucocytosis, and thus to increase the natural resistance to bacterial invasion. It can be given hypodermically or by the mouth. In the former case, the initial dose is ten minims twice a day, and this amount is increased by five minims daily. In the latter case, from half a drachm to a drachm is given twice daily. Like antistreptococcic serum, nuclein sometimes causes severe pains in the bones, especially in the tibia, but these, as a rule, disappear within a week.

Pyæmia or Venous Sepsis.

Pyæmia or venous sepsis is due to the infection of the patient through the veins with pyogenic bacteria. The infecting bacterium, in most cases, is morphologically like that which causes acute sepsis, *i. e. Streptococcus pyogenes;* doubtless mixed forms of infection also occur. In most cases a septic endometritis first occurs and the bacteria are lodged in the clots which fill the uterine sinuses, whence, as the clots break down, they are carried on emboli into the general circulation.

Symptoms.—The onset of pyæmic symptoms does not, as a rule, take place until the tenth day after

delivery. The patient may have had an apparently normal puerperium up to that date, or she may have suffered from sapræmic infection of the uterus. The onset is marked by the occurrence of a severe rigor, followed by a rapid elevation of the temperature to 104° F. or 106 F° (40°–41° C.). The pulse rate increases proportionately. In a few hours the temperature falls to normal, and the patient may appear to be as well as she was previous to the attack. Another rigor, however, follows in from twelve to twenty-four hours, and is followed by others at shorter intervals, corresponding to the infection of hitherto exempted tissues by fresh emboli. Finally, the temperature fluctuates continuously between 100° F. and 106° F. (37·7°–41° C.).

In from three days to a week after the onset of the symptoms, metastatic abscesses form. These may occur in any part of the body, but, as a rule, will follow one or two definite courses. Either they form in the superficial parts of the body, as in the joints, or subcutaneously; or they occur in the deeper organs, as in the liver, lungs, and brains. The formation of each abscess is marked by the occurrence of rigors. The patient may gradually recover, but as frequently dies. Death may occur in several ways:—from exhaustion due to the long-continued suppuration; from septic pneumonia, peritonitis, or endocarditis; or from abscesses forming in vital organs, as the liver and the brain.

Prognosis.—The prognosis is very grave, but it is not quite as bad as in lymphatic sepsis. The more superficially the abscesses form, the better is the prognosis. From 50 to 60 per cent. of cases were

formerly said to die, but this percentage has been lessened by the use of antistreptococcic serum.

Treatment.—Support the patient's strength in every way. Administer alcohol in as large quantities as the patient can be induced to take it, and give the most nutritious and digestible foods. If there is any septic or sapræmic endometritis or vaginitis, it should be treated as has been described (*v.* pages 494, 503). If abscesses form in joints they should be opened at once, in order to prevent, if possible, the destruction of the joint. If they form beneath the skin or muscles, they may be allowed to point before they are opened. In these cases, as in acute sepsis, the hypodermic injection of antistreptococcic serum has sometimes been attended by favourable results. A polyvalent serum should be used as in lymphatic sepsis.

CHAPTER XXIX.

DISEASES ASSOCIATED WITH THE PUERPERIUM.

Pulmonary Embolus—Sub-involution of the Uterus—Mastitis: Varieties - Parenchymatous Mastitis—Interstitial Mastitis—Crural Phlebo-thrombosis—Puerperal Insanity.

PULMONARY EMBOLUS.

Pulmonary embolus, occurring after delivery, is due to the detachment of a clot, most usually from the uterine sinuses, the clot being carried through the right side of the heart into the pulmonary artery.

Ætiology.—Extensive clotting is most likely to occur in cases in which the uterus has not contracted well after delivery. If clotting in the vessels has occurred, any slight movement may be sufficient to determine the detachment of the embolus.

Symptoms.—The onset of the symptoms is extremely rapid. The patient is perfectly well one moment, and the next she is collapsed, asphyxiated, her heart rapid and weak, her breathing frequent and sighing. The duration of the symptoms depends upon the size of the vessel plugged, and upon the strength of the patient. If a large vessel is obliterated, she will die in from a few minutes to a few hours. If the vessel is small, she may gradually recover.

Treatment.—The patient should be supported in a sitting posture by pillows, as in this position she will breathe most easily. The action of the heart must be stimulated and strengthened by the hypodermic injection of strychnine, and ether. Oxygen, if at hand, should be inhaled. Ammonia is especially recommended, both as a stimulant and on the ground that it may assist the absorption of the clot, or at any rate prevent further thrombosis. It may be given as the carbonate of ammonia in five-grain doses, or as the aromatic spirit, in half-drachm doses, at first every hour and subsequently less frequently. If the right side of the heart is engorged, as shown by marked cyanosis and fulness of the superficial veins, venesection to the extent of a few ounces, or the application of leeches often gives considerable relief. Such remedies are, however, only of use when the vessel plugged is of small size; if the main trunk is involved, the prognosis is absolutely bad.

SUB-INVOLUTION OF THE UTERUS.

Sub-involution of the uterus is the condition in which the normal involution of the uterus does not occur, and in which an enlarged and relaxed uterus persists long after the organ should have returned to its normal unimpregnated condition.

Ætiology.—The causes of sub-involution may be briefly stated to include everything that predisposes to abnormal and persistent hyperæmia of the uterus during the puerperium. The most common of such conditions are leaving bed too soon after delivery,

or too much exercise or work even when the patient has not left her bed prematurely ; the presence of a backward displacement of the uterus ; the retention of portions of placenta and membranes ; and putrid or septic endometritis. Nine-tenths of all cases are probably due to leaving bed too soon and the downward displacement of the heavy uterus, leading to its congestion.

Symptoms.—The earliest symptom of sub-involution is the persistence of the lochia beyond the normal period. Later, the symptoms consist in the occurrence of leucorrhœa, in constant backache and bearing-down sensations, and in the presence of an enlarged and soft uterus, which, as a rule, lies lower in the pelvis than it ought to do, and which may be displaced backwards. In any case in which the lochia remain red after the tenth day, or in which the fundus is found above the level of the symphysis after the ninth day, sub-involution is the probable cause. In estimating the height of the fundus, however, it must be remembered that a loaded rectum or a full bladder may push the uterus into an unduly high position, and so make it appear to be enlarged.

Treatment.—The prophylactic treatment of sub-involution consists in the conduction of the third stage of labour in such a manner that placental fragments are not left behind in the uterus, in attention to the regular emptying of the bladder and rectum during the puerperium, in keeping the patient in bed for a sufficient period after delivery, and in correcting any displacements of the uterus that may occur.

If sub-involution is present, any causal factor must

be removed, and the patient kept in bed. Hot vaginal douches may be administered daily, and if there is a persistence of red lochia, it is well to wash out the uterus as well. If there is any reason to suspect that fragments of the ovum or decidua have been left behind, the uterus must be explored by the finger or a blunt curette, and the retained fragments removed. In cases in which the lochia still persist, and are principally composed of blood, we have obtained good results by the injection of half a drachm or a drachm of a fifty per cent. solution of formalin. This is injected by means of Braun's syringe. It is allowed to act for about thirty seconds, and the uterus is then washed out with water. All that is desired is to obtain the momentary action of the formalin on the endometrium, and on no account must it be allowed to remain in the uterine cavity, as its caustic action is too great. Formalin causes uterine contraction, and also helps to bring about a healthy condition of the inside of the uterus by hastening the discharge of any remaining fragments of decidua. It may give rise to pain for a few hours after it has been used, due probably to the contractions it induces.

In addition to the local treatment, ergot may be administered internally. As a rule, it is best to give a few fairly large doses of half a drachm or a drachm of the liquid extract, or a pill containing ergot and strychnine (Strychnine gr. $\frac{1}{30}$; Ext. Ergotæ, grs. iii), may be given night and morning for a week.

MASTITIS.

Mastitis is the term applied to inflammation of the breast.

Varieties.—It occurs in two chief forms :—

(A) Parenchymatous mastitis.

(B) Interstitial mastitis.

(A) **Parenchymatous Mastitis.**—This is the term applied to inflammation of the milk ducts and glands, *i. e.* of the parenchyma of the breast.

Ætiology.—Parenchymatous mastitis is due to the entrance of bacteria through the milk ducts. The bacteria may be derived from the milk, which has been allowed to dry upon the nipple, or infection may result from attempts made with septic fingers to form the nipples.

Symptoms.—The first symptom is the appearance of a patch of inflammation accompanied by considerable pain. As the infection is at first limited to the ducts, and as, usually, only one set of ducts is infected, the area of inflammation corresponds in shape to the area from which the affected ducts come. Hence, it is triangular in shape, with the apex of the triangle at the nipple, the base at the periphery of the breast. There is a sharp line of demarcation between the healthy and the diseased portions of the breast. The inflammation usually tends to subside, but it may extend into the interstitial substance of the breast.

(B) **Interstitial Mastitis.**—This is the term applied to inflammation of the interstitial tissue of the breast.

Ætiology.—Interstitial mastitis may start by the extension of a parenchymatous mastitis ; or, more

commonly, bacteria may find their way directly into the interstitial substance through a crack at the top or the base of the nipple.

Symptoms.—An irregular and ill-defined patch of inflammation appears upon the breast; there is intense pain, and severe constitutional disturbance such as high temperature, rapid pulse, and general malaise. As a rule suppuration occurs, and an abscess is formed. The presence of pus is recognised not by fluctuation, which is difficult and sometimes impossible to obtain unless the abscess is very superficial, but by the presence of œdema over the point of suppuration.

Treatment.—The prophylactic treatment of mastitis should be adopted in all cases, but particularly with primiparæ. It consists in hardening the skin of the nipples in order to avoid subsequent laceration (*v.* page 114), and in instructing the patient in the duty of keeping her nipples clean. They should be washed both before and after the child takes the breast. Also, milk should not be allowed to accumulate in the breast, if, for any reason, nursing is stopped. Such an accumulation, though not in itself sufficient to cause mastitis, still provides a suitable nidus for any germs that may gain admittance. If a crack occurs on or round the nipple, it must be cured as quickly as possible. This is done by touching it lightly with nitrate of silver, or better still by painting it twice daily with Tr. Benzoin. Co. If *parenchymatous* mastitis occurs, the breast should be firmly bandaged to the chest wall, the nipple being first covered with a small piece of lint soaked in a fifty per cent. solution of Tr. Benzoin. Co. It is well also to administer a hydragogue purgative.

If we believe the mastitis to be *interstitial*, and pus to be likely to form, antiseptic compresses may be used to prepare the skin for incision. If an abscess forms, it must be opened immediately. The occurrence of œdema is a positive indication of the presence of pus; it is unusual to be able to obtain fluctuation. The following treatment of abscess of the breast is most successful :—Open into the most dependent part of the abscess by a radial incision, sufficiently large to admit the index finger. Let the pus drain out, and then pass in the finger, and with it break down all the diseased tissue. By this means the walls of the loculi in which the pus is stored are broken down, and one large cavity is formed. Next, curette the cavity with a large curette, choosing one which is not too sharp, and douche it out thoroughly so as to wash away all the *débris*. Plug the cavity tightly with iodoform gauze, and bandage the breast as firmly as possible to the chest wall.

The gauze must be changed every twenty-four hours, and the cavity replugged, until the day comes when there is no pus on the gauze. This date varies from the second to the sixth day after opening the breast, according to the size of the abscess. Then the plugging may be discontinued, with the exception of a small piece of gauze in the skin wound in order to keep it open. The breast is bandaged very tightly, so as to bring the walls of the cavity into apposition. After this, it need not be dressed for three or four days. By this time the cavity will have become completely obliterated, and a small superficial ulcer alone will remain, which will take a week or so to heal completely. By adopting the above treatment, the

worst mammary abscess will be completely healed in from two to three weeks, if care is taken to break down *all* the diseased tissue at the commencement.

CRURAL PHLEBO-THROMBOSIS.

Thrombosis of the veins of the leg is by no means an uncommon occurrence after delivery, and may be due to several different causes. In the first place, it may be a simple thrombosis due to the slowness of the circulation of the blood through relaxed veins. Such cases are favoured by anything which weakens the heart's action, and by the presence of varicose veins. The clot may form in the femoral vein, or in the veins of the lower leg. The nearer the heart the thrombosis occurs, the greater will be the disturbance of the venous system of the affected leg, and the more marked the symptoms. In the second place, the thrombosis may be due to an inflammation of the inner coat of the vein. In the majority of cases, this phlebitis is the result of direct extension of infection along the walls of the vein from previously infected uterine sinuses. In a small proportion of cases, however, the phlebitis is localised, and is apparently not continuous with an infection in the uterine sinuses or pelvic veins. The ætiology of such cases is extremely obscure, but it is probable that they are due to the irritation of the walls of the vein by the toxins of infecting organisms.

In a certain number of cases, the lymph channels are obstructed as well as the veins, or perhaps they alone may be obstructed. Such an obstruction may arise from the extension of a lymphangitis from the

pelvic lymphatics, or may be due to the compression of the main pelvic lymph channels by already thrombosed pelvic veins. Cases of lymphatic obstruction are probably always of infective origin, and are now not so commonly seen as they were formerly.

Varieties.—Phlebo-thrombosis of the leg thus occurs in two distinct varieties :—

(1) A primary and simple form, the result of slowness of the circulation through the veins.

(2) A secondary and septic form, the result of the extension of infection from the uterus along the walls of the vein, or of the irritation of the inner coat by toxic substances circulating in the blood. In this form, there may be an accompanying obstruction to the lymph channels.

Symptoms.—The symptoms common to both forms of venous obstruction are pain and swelling of the legs, in proportion to the size and situation of the obstructed vessel. The thrombosed veins, if superficial, can be felt as knotty cords beneath the skin. In the secondary septic form, pain as a rule precedes the swelling. It may start in the groin and then extend down the leg along the course of the infected veins, or it may be referred to a particular place on the thigh or calf. The leg is extremely tender to the touch, particularly over the infected vein. In some cases, localised areas of inflammation may appear along the course of the vein and subsequently break down into abscesses, or the position of the affected veins may be indicated by lines of slight inflammation, running down the thigh. In the condition known as *phlegmasia alba dolens*, or white leg, in which the lymphatics and probably the veins also are affected,

the leg may become of an enormous size, the skin is stretched and is white and glistening, and the pain is intense. If the engorgement is due to the obstruction of the lymphatics alone, the tissues of the leg have a peculiar brawny feel and will not pit upon pressure. If, on the other hand, there is also venous obstruction, the tissues are œdematous and pit on pressure.

In the primary form, there is little or no constitutional disturbance other than that due to the weakness of the patient. In the septic form, on the other hand, there are usually all the evidences of septic infection of a varying intensity. In some cases the symptoms may point to the presence of a septic endometritis or parametritis, in other cases to the existence of a pyæmic condition, while, in a few cases, there may be no definite signs of infection until the presence of thrombosis shows that it must have occurred.

Treatment.—The three main points in the treatment of each form of thrombosis are rest in bed with the leg elevated, regulation of the bowels, and the administration of abundance of easily digested nourishment. Iron may also be given, and strychnine if the heart is weak. The leg must be carefully protected from the pressure of the clothes, particularly in phlegmasia, as in some cases even the slightest touch aggravates the pain. Some relief will be given by wrapping the leg in cotton-wool, and keeping the latter moistened with evaporating lead lotion. In septic forms, where there are localised areas of inflammation, the use of hot antiseptic compresses is preferable. In all cases sudden movements must be avoided, and in no case may friction of the leg be employed on

account of the danger of detaching a clot. If abscesses form, they must be opened. Constitutional symptoms due to the infection must be treated as has been already described.

The patient must not be allowed to leave her bed for at least ten days after all fever, pain, and swelling have disappeared. Usually, however, as soon as she commences to walk, some pain and swelling of the leg will return owing to the uninjured veins not being as yet large enough to carry on the circulation when the woman is in the erect position. Indeed, it is probable that according to the size of the obstructed vessels it will be several months or a year before she is free from all pain, and that, for many years after, the pain and swelling will return to a slight extent after prolonged walking or standing.

PUERPERAL INSANITY.

Puerperal insanity is the term applied to a form of madness which sometimes occurs during pregnancy or the puerperium, or as a result of overlactation. It may last for the remainder of the patient's life, but in the majority of cases it is only a temporary affection.

Varieties.—Two varieties are met with :—

(1) Melancholia.

(2) Mania.

Frequency.—At the Rotunda Hospital, amongst 25,790 patients, the relative frequency of mania occurring during the puerperium was 1 in 560·65, of melancholia 1 in 5158.

Ætiology.—Insanity may be a primary condition,

the result of heredity, alcoholism, or epilepsy; or it may be merely a symptom of sepsis.

Symptoms.—Mania rarely occurs except during the puerperium. Melancholia may also occur at that time or during pregnancy, but is most frequently the result of overlactation. When either form occurs during the puerperium, its symptoms usually come on from two to twelve days after delivery. In *melancholia,* the patient is extremely depressed, and is frequently found in tears, without any apparent cause. This in itself should be sufficient to direct attention to her condition. If a patient is found to be continually fretting after delivery, without cause, she is probably suffering from either melancholia or sepsis, or perhaps from both. She is usually sleepless, and may have various delusions. In *mania,* the patient loses all idea of her surroundings, her mind is in a state of chaotic confusion, her moral faculties are affected. One moment she is extremely violent, the next passive and docile. She is the victim of delusions and illusions.

Treatment.—During pregnancy freedom from worry, fresh air and moderate exercise, good food, regulation of the bowels, and sleep are the essentials of treatment, and the patient should be, as a rule, separated from her husband and relatives. Constant watching to guard against suicide is necessary throughout. In severe cases it is usually necessary to send the patient to an asylum, unless careful nursing and frequent medical supervision can be provided at home. The induction of abortion or premature labour is rarely justifiable. The use of opium should be avoided, but small doses of chloral and bromides may be given if necessary. Simple tonics, and

especially the glycero-phosphates, free phosphorus, or lecithin (from three to five grains in the day) are indicated, but, for the sake of the child, as few drugs as possible should be used.

During the puerperium, on the first appearance of suspicious symptoms, the infant must be removed, and the patient kept quiet, and under constant supervision for fear of suicide. Attention must be paid to the breasts, and any evidence of septic infection must be treated as its form necessitates. The bowels should be freely opened by saline purgatives. The attack may sometimes be cut short at the outset by full doses of chloral or paraldehyde by the mouth or the rectum, so as to secure deep sleep. If these measures fail, the patient should be sent to an asylum without delay, unless skilled nursing and medical attendance is available. Separation from her husband and children is in all cases essential, and, if there is no improvement within six weeks, the patient should be sent to an asylum.

The recovery of the patient depends on efficient and early treatment, the most important part of which is suitable and sufficient food. Large amounts of liquid nourishment—eggs, milk, beef-tea, strong soups, plasmon, and the like, with cod-liver oil or malt-extract—must be given every few hours, both night and day, if necessary, by the nasal or mouth tube. Malt liquors are particularly useful, and may be taken in large quantities. As purgatives, repeated and full doses of calomel, jalap, or even croton oil are well borne, and should be given if necessary. In order to induce sleep, paraldehyde, chloral with bromide, or sulphonal if there is much excitement,

may be tried, but the use of opium or hyoscine must be avoided. Sponging, the wet pack, and prolonged warm baths are useful to relieve restlessness. If the temperature is high, from ten to fifteen grains of quinine should be administered every few hours, and, in cases of septic infection due to the streptococcus, anti-streptococcic serum may be tried.

When the stage of excitement is passing off, the patient should spend as much time as possible in the open air, and, in the later stages of the disease, the use of Easton's syrup or a similar tonic and of iron is indicated.

If insanity starts during lactation the patient should always be sent away from home, but not necessarily to an asylum, save in the early and acute cases, and especially in the maniacal cases. Good nursing and constant watching are always necessary. The baby must be weaned at once. The bowels must be kept open with laxatives. Change, rest, fresh air, a generous diet, stimulants if required, baths and cold douches to the spine, moderate exercise as recovery progresses, and tonics, such as quinine, iron, and arsenic, constitute the treatment. Sedatives are to be avoided as far as possible, and sleep secured by fresh air, exercise, baths, and night-feeding. The use of paraldehyde, bromides, or sulphonal may sometimes be necessary, and in cases of marked depression, especially if accompanied by agitation, opium may give relief.

Prognosis.—More than half the cases recover within six months, but if there is any trace of hereditary taint, the patients are always liable to a relapse during or after subsequent confinements.

CHAPTER XXX.

ARTIFICIAL DILATATION OF CERVIX—INDUCTION OF ABORTION AND PREMATURE LABOUR.

Artificial Dilatation of the Cervix, by Incision of the Cervix by Dilatation of the Cervix—Induction of Abortion—Induction of Premature Labour: Methods: Version, Plugging of the Vagina, Catheterisation of the Uterus, Intra-uterine Injection of Water or Glycerine, Dilatation of the Cervix, Rupture of the Membranes.

ARTIFICIAL DILATATION OF THE CERVIX.

Obstetrical dilatation of the cervix as distinct from gynæcological dilatation, can be obtained in one of two ways :—

(A) By incision of the cervix.

(B) By dilators.

(A) **By Incision of the Cervix.**—Dilatation of the cervix, by means of multiple incisions, was introduced by Dührssen. According to him, it constitutes an easy and efficient way of obtaining the necessary dilatation for delivering the fœtus in cases in which the whole supra-vaginal portion of the cervix is already fully dilated, and in which the defective dilatation is limited to the vaginal portion. This

condition is usually found only in primiparæ, as in them the supra-vaginal portion of the cervix dilates first. In multiparæ, on the other hand, the supra-vaginal portion dilates at a later period of labour, and, consequently, it is rarely possible to perform this operation.

Indications.—Incision of the cervix is indicated in the following cases :—

(1) Stenosis of the vaginal portion of the cervix, which will not yield to the use of sedatives and hot douches (*v.* page 443).

(2) Cases in which immediate delivery is indicated, in which the supra-vaginal portion of the cervix is dilated, but the vaginal portion is not, and in which dilatation cannot be effected by Frommer's dilator.

Instruments.—The following instruments are necessary :—A posterior speculum ; a stout blunt-pointed scissors ; Martin's needle-holder ; silk ; whole-curved needles of medium and small size ; two or three American bullet forceps.

Operation.—The patient is placed in the cross-bed position and the vagina is thoroughly douched. The posterior margin of the cervix is then seized with two American forceps, one a little to each side of the middle line. The piece of cervix lying between the forceps is then taken between the middle and index fingers of the left hand, the former finger in the vagina, the latter in the cervical canal. The fingers should reach right up to the vaginal insertion. The points of the scissors are then pushed along the fingers, and the cervix divided. Then the lateral margin of the cervix is similarly seized, each side

in turn, and divided, and lastly the anterior margin. In cases in which there is extreme rigidity of the cervical tissues from structural change, it may be necessary to make additional incisions between the others. If so, they are made in a similar manner. Each incision can, as a rule, be made with two cuts of the scissors, and should extend right up to the vaginal insertion.

After the delivery of the child, Dührssen recommends to plug the utero-vaginal canal or the vagina alone, if there is any hæmorrhage. He does not consider that it is necessary to suture the incisions. We should, however, prefer to suture them in order to avoid a subsequent ectropion. The suturing presents but little difficulty, if the cervix is well depressed by traction with forceps and by pressure on the fundus. If it is decided to suture, each incision is closed by two or three sutures passed at right angles to the incisions. The sutures should be removed in ten days.

(B) **Dilatation by Dilators.**—There are two classes of dilator which are intended for use in obstetrical cases. These are :—

(1) Metal dilators with four or more eccentric limbs, of which Bossi's dilator is the prototype.

(2) Hydrostatic dilators, of which Barnes' dilator is the prototype.

The best pattern of metal dilator for use in obstetrical practice is Frommer's modification of Bossi's dilator (*v.* Figs. 173, 174). As seen in the illustration, it consists of eight limbs, the points of which can be divaricated eccentrically by means of

a screw handle. An indicator at the side shows the exact degree of dilatation which has been obtained. The limbs of the instrument are all detachable, and can be readily cleaned. The presence of eight limbs prevents undue pressure on the cervix at any point, and enables the cervix to be dilated gradually and without laceration. For this reason it has a manifest

Fig. 173.—Frommer's dilator, blades slightly separated.

advantage over Bossi's dilator, which has only four limbs. Metal dilators of this type offer the following advantages :—

(1) They can be used in the case of a cervix

Fig. 174.—Frommer's dilator, blades more widely separated.

in which neither dilatation nor taking up has commenced.

(2) They enable a sufficient degree of dilatation to be obtained to permit the delivery of a full-term fœtus.

(3) They enable this degree of dilatation to be obtained rapidly, if necessary in from fifteen to twenty minutes.

(4) They excite uterine contractions, even in a uterus suffering from inertia.

Two forms of hydrostatic dilators are in general use, Champetier de Ribes' and Barnes'. The former of these is preferable, inasmuch as the manipulations necessary for its use are less than in the case of Barnes' dilator. Champetier de Ribes' hydrostatic dilator consists of a conical bag made of inelastic water-proofed silk (*v.* Fig. 175). The base of the bag measures three and a half inches, and the bag tapers through a length of six inches (9 cms.) to a diameter

FIG. 175.—Champetier de Ribes' hydrostatic dilator.

of half an inch (1 cm.). It is slightly curved to suit the curve of the genital canal, and its fluid capacity is about twenty-two ounces (629 c.cs.). Barnes' hydrostatic dilators are fiddle-shaped rubber bags of varying sizes, the smallest of which is introduced first, followed in turn by the others according as the os dilates (*v.* Figs. 176, 177).

Indications.—Instrumental dilatation of the cervix is indicated in the following conditions :—

(1) Cases of pelvic contraction, when, owing to the early rupture of the membranes and the slow

advance of the presenting part, the cervix is not dilating, and when delivery *per vaginam* is possible.

(2) Cases of cervical stenosis which will not yield to the use of sedatives and hot douches.

(3) When it is desired to effect rapid delivery in certain complications of pregnancy and labour, such as eclampsia, concealed accidental hæmorrhage, grave renal, pulmonary, or cardiac complications, and in the presence of a dead and putrid fœtus.

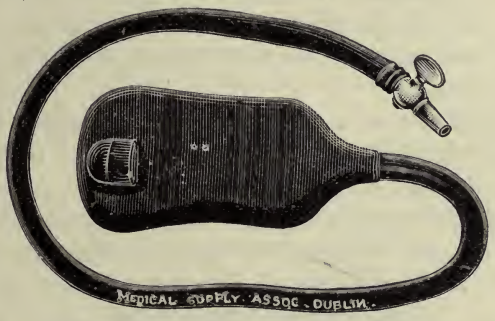


Fig. 176.—Barnes' hydrostatic dilator.

Fig. 177.—Syringe for filling Barnes' hydrostatic dilator.

(4) Champetier de Ribes' dilator is recommended in certain cases of placenta prævia. We do not recommend its general use for this purpose.

Instruments.—If Frommer's dilator is used, no other instrument is required. If Champetier de Ribes' dilator is used, a slightly curved, narrow-bladed, and fenestrated forceps, for introducing the dilator, is also required.

Operation.—The patient is placed in the cross-bed

position, and the vagina is thoroughly douched. If Frommer's dilator is used, it is passed closed through the cervical canal, and then by turning the handle the blades are very slowly and gradually divaricated. After each quarter or half turn of the handle, a couple of minutes' interval should be allowed, and the entire process of dilatation, in cases in which the os was completely closed, should take from forty-five minutes to an hour. The vagina should be douched from time to time with hot creolin lotion, during the process of dilatation, as this tends to increase the softness and dilatability of the cervical tissues.

If Champetier de Ribes' dilator is used, it is first sterilised by boiling, then folded along its long axis, caught in the forceps, and passed gently upwards through the uterine orifice. If the orifice is not of sufficient size to permit of the introduction of the forceps, it must be previously dilated with Hegar's dilators. If the uterine orifice is of sufficient size, it is advisable to pass the tips of the fingers through the orifice, and to guide the forceps in between them. The bag should penetrate four to four and a half inches (10 to 11 cm.) within the internal os. The douche is then attached to the nozzle of the dilator and allowed to run, taking care that there is a sufficient head of water. As the dilator fills, the forceps is gradually opened, and is withdrawn as soon as the size of the dilator is sufficient to prevent it from slipping out. If sufficient head cannot be obtained to make the water flow, it may be injected by means of a new Higginson's syringe. It is best to use a one per cent. solution of carbolic acid in water

for filling the dilator. According to the inventor, if 22·4 ounces (627·6 c.cs.) are injected into the dilator, the latter has a maximum circumference of 13 inches (33 cm.) ; if 18·9 ounces (510 c.cs.) are injected, of 10·6 inches (27 cms.) ; if 15·4 ounces (440 c.cs.) are injected, of 8·7 inches (22 cms.). As the circumference of the full-term fœtal head is about thirteen inches (33 cms.), in vertex presentations the dilator will require to be filled to almost its full extent. As soon as the uterine orifice is of sufficient size, the dilator is expelled by the uterine contractions.

In addition to these two methods of obtaining dilatation of the cervix, two other methods, in common use in gynæcological practice, may sometimes be required in obstetrical practice. These are rapid dilatation of the cervix by means of Hegar's graduated dilators, and gradual dilatation by means of sea-tangle tents. As these methods are fully described in gynæcological handbooks, we do not consider it necessary to describe them here.

INDUCTION OF ABORTION.

Induction of abortion is the term applied to the bringing on of labour before the child is viable, *i. e.* before the twenty-eighth week. It is only justifiable under very exceptional circumstances.

Indications.—Abortion should be induced only in order to save the life of the mother. It is indicated in :—

(1) Cases of retroflexion of the pregnant uterus, which cannot be replaced.

(2) In certain diseases of pregnancy, as hyper-

emesis; and, perhaps, in exceptional cases of cardiac, renal, or pulmonary affections.

(3) In cases of contracted pelvis, in which delivery through the vagina is impossible, and in which there is reason to consider that the life of the mother will be seriously endangered if the pregnancy is allowed to continue to full term. Such cases are very rare, as Cæsarean section, or pubiotomy at full term is usually possible.

Methods.—Before the formation of the placenta (*i. e.* before the fourth month), dilate the cervix, detach the ovum with the finger and express it as has been described (*v.* page 339). Dilatation may be started by means of sea-tangle tents, and completed by means of Hegar's dilators. From the fourth to the sixth month, puncture the membranes with a stilette. From the sixth month on, induce labour by Krause's method, as described under the "induction of premature labour" (*v.* page 536).

INDUCTION OF PREMATURE LABOUR.

Induction of premature labour is the term applied to the bringing on of labour any time after the child is viable, but before full term. As the operation is usually performed in order to save the child's life, it is almost useless to attempt it before the thirtieth week. The child is viable after the twenty-eighth week, but in practice the mortality among infants born before the thirtieth week is so high, that it is useless to induce labour, in order to save the child's life, before that time. Again, for cases of contracted pelvis, it is useless to induce labour after the thirty-

sixth week. The transverse diameter of the child's head has reached its maximum size by this date, and labour induced after this will not procure an easier confinement, but will bring into the world a weaker child, than if the patient is allowed to go to term.

Indications.—Premature labour may require to be induced for any of the following reasons:—

(1) Contracted pelvis measuring from $3\frac{1}{4}$ to $2\frac{3}{4}$ inches in the true conjugate.

(2) Habitual death of the fœtus at some period after it has become viable, except when due to syphilis.

(3) Ante-partum hæmorrhage.

(4) Hydramnios causing urgent heart symptoms.

(5) Certain diseases of pregnancy, as hyperemesis; and, perhaps, in exceptional cases of cardiac, pulmonary, and renal disease, and of eclampsia.

Methods.—There are several methods of inducing premature labour, and no one method will suit every case. The method we should adopt depends upon the indication for its adoption. Premature labour may be induced by the following methods:—

(A) Podalic version, and rupture of the membranes.

(B) Plugging the vagina.

(C) Catheterisation of the uterus.

(D) Intra-uterine injection of liquids, as glycerine or water.

(E) Dilatation of the cervix, digitally, with hydrostatic dilators, or with Frommer's dilator.

(F) Rupture of the membranes.

(A) **Version.**—Version, followed by rupture of the

membranes, is the method to be adopted in certain cases of placenta prævia, as it both checks the hæmorrhage and induces labour, which are the two things we require. This method will be discussed in full later (*v.* page 557).

(B) **Plugging the Vagina.**—This is the method to be adopted in certain cases of accidental hæmorrhage. It has a similar effect as the former method has in cases of placenta prævia, *i. e.* it induces labour and checks hæmorrhage. It has been discussed in full (*v.* page 377). In addition to plugging the vagina, it has been also recommended to plug the lowest zone of the uterus with sterilised gauze soaked in ichthyol glycerine (Spineli). To do this, the cervix must first be dilated by means of Hegar's dilators to a size sufficient to admit the finger.

(C) **Catheterisation of the Uterus.**—Catheterisation of the uterus with flexible gum-elastic bougies. This is Krause's method of inducing labour, and is perhaps the best method to adopt in cases of contracted pelvis. It is a very simple operation to perform, but is not free from risk, as it is very easy to infect the patient with sepsis whilst performing it. The operation can only be considered safe when it is performed under the most scrupulous aseptic precautions. To perform it, the patient is placed in the cross-bed position, under an anæsthetic or not, as is thought best; the external genitals are shaved and thoroughly washed, and the vagina is well douched. The cervix is then exposed by passing a posterior speculum in order to prevent the bougies, while they are being introduced, from coming into contact with the vaginal wall, and the

anterior lip is seized with a bullet forceps and drawn down. Two, three, or even four flexible gum-elastic bougies are then passed, one by one, upwards between the membranes and the uterine wall, as far as they will go. They should be passed in very gently and allowed to take their own direction. If they meet with any resistance, withdraw them, and pass them again in another direction. The ends of the bougies which protrude are then wrapped round with iodoform gauze, in order to protect the vagina. Labour may ensue in a few hours, or may not ensue for a few days. The bougies are taken out when the patient gets into strong labour, or when they have been in without result for twenty-four hours. In the latter case, after douching the vagina, a fresh set is introduced. If two or three sets have been introduced without result, the os should be dilated by Frommer's modification of Bossi's dilator, or by Champetier de Ribes' hydrostatic dilator; labour will then almost certainly ensue. If, as may happen in very rare cases, labour even then does not come on, the forceps must be applied, or podalic version performed, and the fœtus extracted. The bougies used must be carefully sterilised. This is best done by boiling them for ten minutes, and then letting them lie for at least three hours in corrosive sublimate solution (1 in 500).

(D) **Intra-uterine Injections.**—The intra-uterine injection of a small quantity of glycerine with the object of bringing on labour was introduced by Pelzer, who advised the injection of half an ounce slowly between the membranes and the uterine wall. It is said to be a very certain and rapid method, but also to be

dangerous, as it tends to set up nephritis and to cause a disintegration of the red blood-corpuscles. Pelzer claimed that it acts :—

(1) By mechanical separation of the membranes.

(2) By direct stimulation of the muscle-fibres of the uterus.

(3) Owing to its hygroscopic properties, by drawing liquor amnii through the membranes and thus rendering them flaccid.

More recently, Kossman recommended and successfully practised the injection of 5 c.c. (85 minims) of glycerine into the cervical canal. He considered that accidents were caused by using large quantities for hygroscopic purposes, while small quantities used with the object of stimulating muscle-fibre, as in the rectum, were perfectly safe.

(E) **Dilatation of the Cervix.**—This is best practised in conjunction with Krause's method, if necessary. It can be performed digitally, by Bossi's dilator or by Frommer's modification, or by means of Barnes' or Champetier de Ribes' hydrostatic dilators. Digital dilatation is very liable to tear the cervix, and is not to be recommended. Dilatation at all is very rarely necessary, and if it has to be performed it is best done by Frommer's modification of Bossi's dilator. If this instrument is not available, Champetier de Ribes' dilator is probably the next best form to use, as its action resembles that of the unruptured membranes (*v.* page 530).

(F) **Rupture of the Membranes.** — This — Scheel's method—is the most simple method of inducing labour. Labour thus induced may, however, not start for some days, and, before it starts, intra-

uterine decomposition may occur, and necessitate the immediate emptying of the uterus. Also, even if labour starts satisfactorily, the dilating action of the membranes is lost, and so the labour is tedious. Rupture of the membranes is the best method to adopt in cases of hydramnios, as it will at once relieve the cardiac symptoms due to the pressure of the large uterus.

CHAPTER XXXI.

THE APPLICATION OF THE FORCEPS.

Varieties of Forceps—Neville's Axis Traction Forceps—Methods of using the Forceps—Conditions—Indications—Method of Application—The Forceps in Occipito-posterior Positions of the Vertex, in Face Presentation, in Brow Presentation, in Breech Presentation.

The term "forceps," as used in midwifery, means an instrument adapted for seizing and extracting the head of the child.

Varieties.—There are two chief varieties:—(1) the short forceps, (2) the long forceps. The short forceps has only a single curve corresponding to the curve of the child's head. It is intended for use when the head lies low down in the pelvis, and is not suitable in any other case. As the long forceps will deliver the head in any position, the short forceps has been given up, as being a needless addition to the obstetrical armamentarium. The long forceps consists of two blades, an upper and a lower, each blade possessing two distinct curves—a cephalic curve, which enables it to be adapted to the child's head, and a pelvic curve, which enables it to be adapted to the curve of the pelvis. Students often find a difficulty in deter-

mining which is the upper, and which the lower blade. To do so, imagine your patient in front of you lying on her left side. Then, hold the blade in your hand, in such a position that its pelvic curve corresponds with the pelvic curve of the mother. If the concavity of the cephalic curve is then directed upwards, it must be the lower blade, as otherwise it could not be adapted to the fœtal head ;

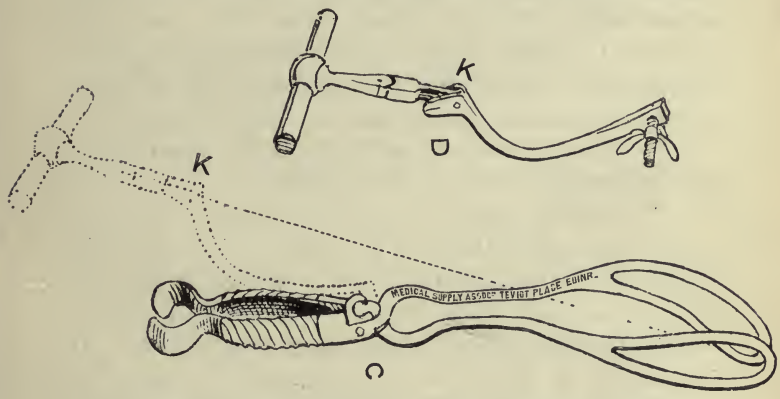


Fig. 178.—Neville's axis-traction forceps. C. Barnes' long forceps. D. Neville's axis-traction rod. K. Arrow-head indicator.

if downwards, it must be the upper blade, for a similar reason.

There are many patterns of long forceps, both plain and with an axis-traction apparatus. An axis-traction forceps is one which has fitted to its blades or handle an appliance for applying traction in the proper direction. This appliance is called an axis-traction rod, and is so adjusted, that, by pulling in the direction shown by an indicator or by the position of the handles, we are always pulling the head down-

wards in the axis of the pelvis. Every one prefers the pattern of forceps to which he is accustomed; but, to any one who is buying his first forceps, we strongly recommend Barnes' long forceps with Neville's axis-traction apparatus adjusted to it (*v.* Fig. 178). The great advantage of this pattern is that the traction apparatus is entirely outside the vagina when the forceps is applied; that it is uncomplicated; that it is a true axis-tractor; and that the forceps can be used with or without the traction apparatus as desired. In choosing one of these forceps the points that should be observed are:—

(1) That the arrow-head indicator is parallel to the fenestrated portion of the blades.

(2) That the forceps is not too flexible.

(3) That the portion of the blade which comes in contact with the child's head is flat, or even very slightly concave, never convex, as it is often made.

The forceps should be only used as a tractor. It is useless to use it as a compressor in order to diminish the diameter of the child's head. It seizes the head approximately in the transverse diameter of the pelvis; and, if it is made to compress the head, it causes a compensatory increase in that diameter of the latter which lies in the conjugate diameter of the pelvis, *i. e.* in the diameter which most requires reduction. This is especially the case when the head is above the brim, and it is one of the reasons for avoiding the so-called "high forceps" operation, as it is then impossible to avoid compression. The forceps also should not be used as a lever, *i. e.* by giving oscillating movements to the handles; as, by so doing, the mother's soft parts are

made the fulcrum, and considerable harm may be done.

Indications.—The indications for the use of the forceps may be divided into two groups:—

I. Indications on behalf of the child.

II. Indications on behalf of the mother.

I. In the first group are included:—

(1) A fœtal heart-rate rising progressively above 160 in the interval between the pains, or falling below 120.

(2) Tumultuous movements on the part of the fœtus.

(3) The coming away of meconium, unmixed with liquor amnii, in a head presentation.

(4) Prolapse of the cord (*v.* page 461).

II. In the second group are included:—

(1) Accidental hæmorrhage (*v.* page 379), and placenta prævia (*v.* page 385).

(2) Threatened rupture of the uterus (*v.* page 484).

(3) Unduly prolonged second stage, as shown by the exhausted condition of the patient.

(4) Convulsions (*v.* page 332).

(5) Cardiac, pulmonary, or renal disease.

(6) Hæmatoma of the vulva (*v.* page 479).

The foregoing indications must not be regarded as all equally absolute. Provided the conditions necessary for the safe application of the forceps are fulfilled, they are all absolute, because the forceps then furnishes the best means of delivering the fœtus with a minimum of risk to it and to the mother. If, however, these conditions are not fulfilled, then it is necessary to decide whether the danger incurred by

waiting is so great as to necessitate the immediate delivery of the fœtus, and, if it is so great, whether the forceps offers the best means of effecting delivery under the circumstances.

For the safe and easy application of the forceps, the following conditions must be fulfilled:—

(1) The uterine orifice must be sufficiently dilated to allow the passage of the fœtus. If it is not so dilated we are using the forceps not alone as a tractor, but as a dilator, and it is preferable, first to effect dilatation of the cervix, and then to apply the forceps, rather than to drag the fœtal head through an imperfectly dilated orifice and to run the risk of causing deep lacerations of the cervix. If, as sometimes happens, the forceps must be applied through an imperfectly dilated orifice, traction must be made with extreme slowness and gentleness, in order to avoid laceration.

(2) The fœtus must present by the vertex, or posterior fontanelle, or, if the face presents, the chin must have rotated forwards. In other presentations of the head, it is doubtful whether the forceps offers a better prospect of effecting delivery than do the unaided uterine contractions, and probably it is only when the latter are feeble that the forceps will prove of service.

(3) The greatest diameter of the head must have entered the pelvic brim. Even in a normal pelvis and with an axis-traction forceps, there is always a difficulty in pulling a head which is free above the brim into and through the latter. It must be remembered that an axis-traction forceps only enables one to pull in the direction of the axis

of the upper half of the blades of the forceps. If this portion of the blades lies in the axis of the pelvic inlet, then our traction will correspond with that axis, but if the blades do not so lie, then our traction will not be made in the axis of the inlet. If the head is fixed in the brim, the pelvic curve of the forceps, and the manner in which the forceps adapts itself to the head, ensure that, for all practical purposes, the axis of the blades lies in the required position, but when the head is free to move about above the brim there is no certainty that it will so lie. Rather, there is the extreme probability that we are wasting a certain amount of energy in pulling the head against the symphysis. Further, if the head is lying at the brim in an asynclitic position (*v.* page 169), the forceps tends to drag it downwards in this position, and prevents it from gradually correcting itself, as it would do if acted on by the uterine contractions alone. Lastly, if the head is free above the brim at a time when there is an indication for immediate delivery, it is probable that there is a disproportion between the head and the brim; and this disproportion is bound to be increased by the lateral expansion of the head that results when the blades of the forceps drag the base of the skull downwards, and the rigid pelvic ring presses the sides of the skull upwards.

(4) Uterine contractions must be occurring with sufficient regularity and force to ensure the subsequent detachment and expulsion of the placenta, and the closure of the uterine sinuses. If there is uterine inertia, the danger of post-partum hæmorrhage is considerable, although in some cases delivery by the forceps appears to act beneficially on the con-

tractions and to serve to stimulate them. Uterine inertia is frequently given as an indication for the application of the forceps, but we consider it more correct to regard it as a contra-indication to their use. The presence of uterine inertia may necessitate, but it never indicates, the use of the forceps.

Method of application.—The forceps may be applied with the patient on her side, or on her back. The former position is usually adopted in this country, and therefore we shall describe it, though personally we have of late years always adopted the dorsal position, and consider it to be preferable.

The patient lies on her left side, her buttocks projecting slightly over the edge of the bed, and her thighs and legs flexed. During the introduction of the blades, the nurse holds the right leg with the knee raised, but, as soon as traction is commenced, she should sit on the bed behind the patient's back, and, bringing the left hand round the thigh from inside and the right hand round from outside, clasp them firmly so as to encircle the thigh at the fold of the nates. In this position she can provide the necessary counterstrain to the traction exerted by the operator, and so prevent the patient from slipping too far off the bed.

As soon as the patient has been thoroughly washed, disinfected, and anæsthetised, the bladder is emptied with a catheter, and the membranes ruptured. A careful vaginal examination is then made to determine the exact presentation and position of the head and its relation to the pelvis, the condition of the cervix, and the presence of any abnormality of the pelvic walls or the soft parts.

There are two methods of applying the forceps, both of which have their advocates. The first consists in applying it in relation to the pelvis, so that the forceps always lies in relation to either the transverse or the oblique diameter of the pelvis, and that consequently the pelvic curve of the forceps always corresponds more or less exactly with the curve of the pelvis without taking into consideration the position of the head. The second method consists in applying it in a fixed relation to the head whatever may be the position of the latter. Thus, in a vertex presentation, it is so applied that the blades lie along each side of the head, the long axis of the fenestræ corresponding as closely as possible with the supra-occipito-mental or the occipito-mental diameter of the head (*v.* Fig. 179). The latter method is, undoubtedly, the more correct, and is the method which will allow the head to be extracted with the least force.

Every obstetrician has been brought up to practise one or other method, and he will probably adhere to that with which he is most familiar. It is important to remember that in the majority of cases there is no essential difference between the two methods, and that it is only in atypical positions of the head that the one method differs from the other. These are, however, just the cases in which difficulties often arise, and in which every manœuvre that facilitates delivery is of assistance. For this reason, we advise the student to learn both methods, and, in all cases, so far as possible, to endeavour to apply the forceps in whatever manner enables the head to be delivered with the least amount of force.

The Pelvic Method.—When the patient lies in the left lateral position, the left or lower blade of the forceps is taken in the right hand, and the left hand is passed into the vagina and upwards into the hollow of the sacrum behind the head, and the fingers are slipped inside the lips of the cervix, if any portion of the latter can be felt. It is essential to introduce the hand so far as is necessary to make certain that the taking-up of the cervix is complete, as otherwise the blade may be passed outside the cervix, and so include the latter between it and the fœtal head. If this happened, as soon as traction was made we should be dragging down not only the head, but also the uterus, and most serious, if not fatal, consequences might result. The blade is then passed through the vulva, and the point is slipped upwards along the palm of the hand until it has passed above the greatest convexity of the head. The handle is then gently rotated, so that the blade travels round the head and comes to lie at the left end of the transverse diameter of the pelvis. The handle is then carried further backwards and towards the middle line, a movement which has the effect of carrying the blade higher into the pelvis and more fully round the greatest convexity of the head. This blade is now in position, and is maintained there either by an assistant or by slight pressure with the palm of the hand in the vagina. The right blade is next taken, and is introduced in a similar manner except that the rotation of the handle is made in the opposite direction, so as to bring the blade to lie in relation to the right end of the transverse diameter of the pelvis. The handles are then crossed and interlocked.

We have said in our description that the blades are brought to lie at the opposite ends of the transverse diameter of the pelvis, but, as a matter of fact, it is but rarely they remain in this position. If the head lies with its antero-posterior diameters corresponding to one oblique diameter, the forceps tends to slip round until it lies in the opposite oblique diameter.

If the forceps is applied with the patient in the dorsal cross-bed position, the manner of introducing the blades differs slightly. The left lower blade is still introduced first, but it is held in the left hand, while the right hand serves as the vaginal guide. Similarly, the right blade is held in the right hand, while the left hand serves as the vaginal guide. If the head is high in the pelvis, the operator must sit upon a low seat, as otherwise he will not be able to get his hands sufficiently low to pull in the correct direction.

The Cephalic Method.—The cephalic method of applying the forceps is as follows:—Introduce as much of the hand as is necessary into the vagina, and determine the position of the posterior ear. Then, apply over that ear the corresponding blade of the forceps. If the ear is directed to the left side of the pelvis, apply the left blade; if to the right side, apply the right blade. If the head lies transversely, apply the left blade when the occiput points to the left, and the right blade when the occiput points to the right. If the head lies antero-posteriorly, and, consequently, neither ear is posterior, apply the left blade first over the ear which is directed towards the left side. As soon as this

blade is in position apply the second blade over the opposite ear. The blades are guided into position by means of a hand in the vagina passed upwards beside the head, as has been described. If the patient is lying on the left side, the left hand is introduced in each case into the vagina. If the patient is lying on the back, the right hand is introduced when the left blade is being applied, the left hand when the right

Fig. 179.—The manner in which the forceps should grasp the head in a vertex presentation.

blade is being applied. In all cases, we endeavour to make the forceps lie with the blades over the ears, and with its long axis corresponding to the occipito-mental or sub-occipito-bregmatic diameter of the head (*v.* Fig. 179). In cases in which the right blade is applied first, a slight difficulty will arise, since, when the left blade is introduced, it will lie above the right, and the locks will not fall together. This difficulty can be overcome by rotating the left

handle round the right handle, and so bringing them into their correct relation.

The forceps having been applied by whichever method is thought best, the next point is to extract the fœtus. As soon as the blades have been locked the axis-traction apparatus is applied, the butterfly nut that holds the blades together is screwed up just sufficiently tightly to prevent the blades from falling apart, and traction is applied. Traction should be

Fig. 180.—The forceps applied to the head in the pelvic cavity showing the manner in which traction is applied.

made with one hand at first, and only in the event of this proving insufficient should both hands be used. Traction is made intermittently, and, if uterine contractions are occurring, should be made concurrently with them. The direction in which to pull is shown by the indicator on the axis-traction apparatus. If the head is entering the brim, we first pull downwards and backwards in the axis of the inlet. Then, as the head passes into the pelvic cavity, we pull almost directly downwards, then directly downwards,

then, as the head approaches the outlet, downwards and forwards, and, lastly, as the head emerges, almost directly forwards. As the head is passing over the perinæum the forceps may be removed, or be allowed to remain. Personally, we do not consider that it is a matter of much importance which course is adopted. The advantage of removing the forceps is that the head, when born, is free, and the forceps is out of the way.

If Tarnier's or Milne Murray's forceps is used, we must apply traction in such a manner that the rods of the traction apparatus are always close to the handles of the forceps. If a forceps without any axis-traction adjustment is used, we must pull so as to suit the curve of the parturient canal. That is, if the head is at the brim, first, downwards and backwards; then downwards; then downwards and forwards; and finally, almost straight forwards.

Extraction by the forceps in *occipito-posterior position* of the vertex is always more difficult, and requires the exertion of more force than is necessary in a normal position of the head. In such cases the forceps should be avoided if possible, as serious lacerations of the soft parts are liable to occur. During extraction, the head may rotate so that the occiput comes to lie beneath the pubes. If this happens, the forceps must be removed and reapplied. If the occipito-posterior position persists, the forceps must be carried well forward over the mother's abdomen until the occiput is born, and then in the opposite direction as the face slips from behind the perinæum. The latter is very frequently torn in these cases.

In *face presentation,* the forceps is of little use, save when the non-delivery of the child is due solely to uterine inertia. It may also be tried as a last resource, before performing perforation, when there is an absolute indication for delivery on the part of the mother, if the child is alive, and if the chin has not rotated posteriorly. If it is applied whilst the long diameter of the face lies in the transverse diameter of the pelvis, it will in all probability slip. If it does not slip, the pressure of the blades on the neck will probably kill the child. After rotation of the chin has occurred, the head is so nearly born that the forceps is usually unnecessary (*v.* page 222).

In *brow presentation,* the forceps is contra-indicated. The brow is much more likely to become changed during labour into a face or a vertex, if delivered by uterine contractions alone, than if the forceps is applied (*v.* page 228). The forceps, however, may have to be used under similar conditions to those in a face presentation, provided that the forehead has rotated in front.

In *breech presentation,* the forceps is liable to slip, and also to harm the child. It is better to extract an impacted breech by other means (*v.* page 564).

CHAPTER XXXII.

VERSION—ARRESTED BREECH—IMPACTED SHOULDERS.

Version: Varieties — Cephalic Version: Indications, Methods, External Version, Bipolar Version—Podalic Version: Indications, Methods, External Version, Bipolar Version, Internal Version—Contra-indications to Version—The Extraction of the Fœtus in Pelvic Presentation—Impacted Shoulders.

VERSION.

Version is the term applied to the operation by which one polar presentation is substituted for another, or a polar presentation is substituted for a transverse presentation. There are two varieties of version, each named after the resulting presentation :—

(I) Cephalic version.
(II) Podalic version.

There are three methods of performing version :—

(1) External version, in which the presentation is changed by external manipulations alone.
(2) Internal version, in which the presentation is changed by means of one hand introduced into the uterus.
(3) Combined internal and external version, in which the presentation is changed by

means of two fingers of one hand introduced into the uterus, assisted by the other hand externally on the abdominal wall.

I. Cephalic Version.—The operation of cephalic version consists in changing the original presentation of the child into a head presentation.

Indications.—Cephalic version is indicated in faulty presentations of the child, under the following conditions:—

(1) If rapid delivery is not required.
(2) If there is nothing to prevent the child's head engaging in the pelvis.
(3) If the presenting part is not fixed.

Methods.—It can be performed by—

(A) External manipulations, Wigand's method.
(B) Combined external and internal manipulation, Braxton Hicks' method.

(A) **External Cephalic Version.**—To perform external cephalic version, we require a lax abdominal wall and unruptured membranes. If the patient strains, she must be anæsthetised. As soon as the abdominal walls are lax, ascertain by palpation the exact position of the fœtus; and, by a series of pushing movements, press the head in whatever direction will bring it over the pelvic brim by the shortest route, at the same time pressing the breech in the opposite direction. Then, if the os is nearly dilated, rupture the membranes; and either hold the head over the brim until the uterine contractions cause it to fix, or—which will have the same effect—apply a binder tightly round the patient's abdomen. It is not much use to turn the fœtus before labour

has commenced, as it would probably slip back into its original position.

(B) **Combined Cephalic Version.**—Cephalic version, by the combined method of Braxton Hicks, may be performed before, or soon after the membranes have ruptured. To perform it, introduce as much of the hand into the vagina as is necessary, and push the presenting part upwards out of the brim, and towards the side opposite to that at which the head is lying. If the head lies towards the right side of the patient, use the left hand, and *vice versâ*. Then, with the other hand on the abdominal wall, press the head down, and ensure its remaining there by the same means as in external version.

II. Podalic Version.—This is an operation which is far more frequently required than is cephalic version. It consists in changing the original presentation of the child into some variety of pelvic presentation, and most frequently into a footling presentation, by drawing down a foot.

Indications.—Podalic version is indicated :—

(1) In certain cases of malpresentation of the head, *i. e.* face and brow presentations (*v.* pages 221 and 229), and in posterior parietal presentation (*v.* page 196).

(2) In certain cases of prolapse of the cord (*v.* page 460).

(3) In most cases of placenta prævia (*v.* page 384).

(4) In certain cases of contracted pelvis (*v.* page 430).

(5) In transverse presentation, in which cephalic

version has either failed or cannot be performed (*r.* page 261).

Methods.—Podalic version can be performed by :—

(A) External manipulation only, if it is not necessary to bring down a foot.

(B) Combined internal and external manipulations.

(C) Internal manipulation.

(A) **External Podalic Version.**—External podalic version can be performed under the same conditions as external cephalic version,—namely, lax abdominal walls, the presenting part unfixed, and unruptured membranes. It is performed in exactly the same manner as cephalic version, except that the breech, instead of the head, is brought over the pelvic brim.

(B) **Combined Podalic Version.**—The usual indication for combined or bipolar version, is placenta prævia. To perform the operation, we require lax abdominal walls, unruptured membranes, the presenting part not fixed, and an os which is sufficiently dilated to admit at least two fingers. An anæsthetic is almost always necessary, as the danger of prolapse of the cord is very great if the patient strains. Place the patient in the cross-bed position, ascertain by palpation the exact position of the child, and then turn the child by external version into a transverse presentation. The child must be turned in such a direction that its back will be towards the fundus of the uterus, and its abdomen towards the pelvic brim. If this is done, the foot will be found lying in the neighbourhood of the internal os.

Then introduce the whole hand into the vagina

and two fingers into the cervix, rupture the membranes, and with the hand on the abdomen press the breech downwards; the foot can then be seized and brought out into the vagina. This is easily accomplished if the os is fairly well dilated. In

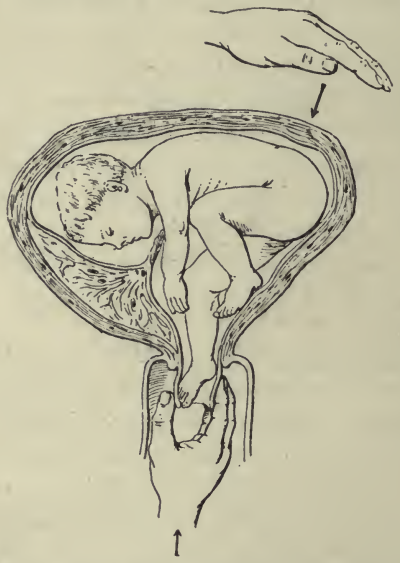


Fig. 181.—Method of completing bipolar version in a case in which the size of the os will not permit of the presence of the foot and the two fingers at the same time. The hand in the vagina pushes the cervix upwards while the foot is made to descend by pressure upon the breech.

some cases, however, the os may be quite large enough to admit two fingers, or to allow the foot to descend by itself, but it may not be large enough to allow all three to pass through it at the same time. If this is so, proceed as follows:—Having passed the fingers into the uterus and seized the foot, draw the

latter down until the toes are through the os internum. Then, draw the fingers gently back into the vagina, and try to push the cervix upwards over the foot, at the same time pressing upon the breech through the abdominal wall, so as to cause the foot to descend (*v.* Fig. 181). When half the foot has by this means been brought into the vagina, seize it and draw it downwards. Lastly, with the hand on the abdomen push the head up to the fundus.

(c) **Internal Podalic Version.**—Internal podalic version can be performed :—

(1) If the os is sufficiently dilated to admit the entire hand into the uterus.

(2) If the presenting part is not too firmly fixed to be displaced.

(3) If no contra-indication to version exists.

The operation can be most easily performed with the patient upon her back. Begin by ascertaining the exact position of the child by palpation. If the case is one of transverse presentation, and if the legs are on the right side of the mother, introduce the right hand into the vagina. If the legs are on the left side of the mother, use the left hand. In a head presentation, the right hand is preferable for every position of the child, save when its limbs are to the right and in front ; under such circumstances the left hand is more suitable. If the operation has to be performed with the patient lying on her side, place her upon the side at which the limbs are, whatever the presentation of the fœtus, and introduce the opposite hand into the vagina ; that is to say, if the limbs are on the left side, place the patient lying on her left side, and introduce the right hand.

Having introduced the hand, seize the first foot that can be felt, and draw it downwards and towards the opposite side of the pelvis (*v.* Figs. 182 and 183). The child is now lying with both head and breech in the lower part of the uterus. The last step of the operation consists in pushing

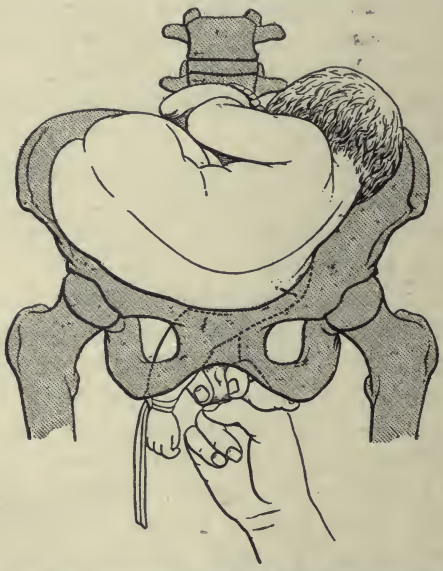


Fig. 182.—Internal version.—The left foot has been drawn down into the vagina. (Farabeuf.)

the head up to the fundus, and at the same time drawing the foot down deeper into the vagina. This may be very easy, or it may be extremely difficult, or even impossible, according to the degree of force with which the uterus has contracted down upon the child. This is the most difficult step of the operation in cases of neglected shoulder presentation. Under

such circumstances, if the head cannot be made to rise to the fundus, as has been described, bring down the other foot and apply traction to both feet. If this is still unavailing, a simple and often successful expedient is as follows:—Make a slip-knot on a strip

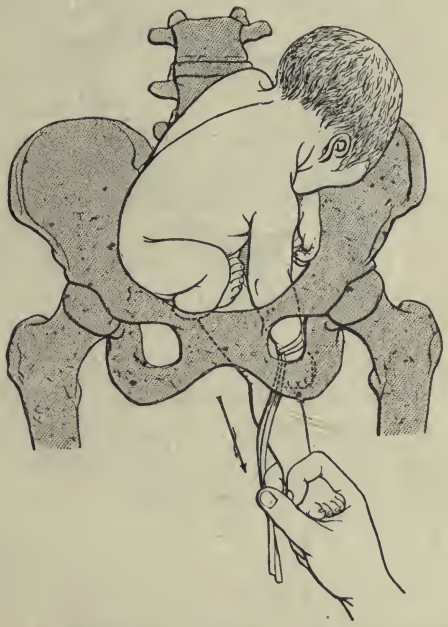


Fig. 183.—Internal version.—Showing the effect of drawing the foot still further downwards into the vagina. (Farabeuf.)

of iodoform gauze, sufficiently long to extend outside the vulva, and pass it upwards round the ankle of one or both feet. Seize the strip with one hand outside the vagina, and pull upon it; while, at the same time, the other hand in the vagina pushes the head upwards out of the false pelvis (*c.* Fig. 184). If

this fails, embryotomy in some form will be necessary, as the child cannot be delivered if it is allowed to remain in this position.

If an arm is prolapsed into the vagina, it is well to slip a noose of gauze over it, in order to prevent

Fig. 184.—Method of completing a difficult case of internal version, by means of a gauze fillet (diagrammatic).

it from subsequently becoming extended and pushed up beside the head during delivery; beyond this, pay no attention to it at first, but draw down the foot as directed. It is unnecessary to try to push the arm up out of the vagina, as it will automatically slip upwards as the head ascends to the fundus.

It will be seen that internal version is also "combined," in that the process is performed by the use of both hands, one inside the uterus, the other on the abdominal walls. The real difference between combined version and internal version, so-called, is that in the former only two fingers are introduced into the uterus, in the latter the whole hand.

Difficulties in the performance of internal version may be caused by :—

(1) Not having ascertained the exact position of the child at the beginning of the operation.

(2) Insufficient dilatation of the cervix. This can be overcome, if necessary, by the use of Frommer's dilator (*v.* page 532).

(3) Passing the hand outside the membranes instead of inside.

Contra-indications.—Version is contra-indicated by the presence of certain conditions :—

(1) If the contractions of the uterus have been so strong that the fœtus is in great part expelled from its cavity. In such a case, in order to turn, the expelled portion of the fœtus would have to be replaced in the uterus, and there is not room for this.

(2) If it is obvious that the child cannot be delivered without embryotomy or craniotomy, even after version. Perforation of the after-coming head is a more difficult operation than perforation of the head coming first, especially in the case of a contracted pelvis.

(3) If the membranes are long ruptured, and the retraction ring is more than two and a half inches (6 cms.) above the symphysis (Winckel). In this case, rupture of the uterus would most probably result.

THE EXTRACTION OF THE FŒTUS IN PELVIC PRESENTATION.

The different procedures, for the extraction of the fœtus in pelvic presentation, are analogous to the application of the forceps in cephalic presentation. Consequently, the indications for these procedures are similar to those for the application of the forceps (*v.* page 543).

Methods.—The extraction of the fœtus in pelvic presentations consists of three distinct procedures:—

(1) The extraction of the pelvic pole.
(2) The liberation and delivery of the arms.
(3) The extraction of the head.

We have already described the last two procedures (*v.* pages 246, 248), and, consequently, here we need only describe the first.

If the breech is delayed at the brim, and pressure upon the fundus during the pains fails to make it advance, bring down a leg. To do so, place the patient in the cross-bed position, introduce the hand into the vagina, and slip two fingers upwards into the uterus along the anterior thigh. If the child is lying with its knees flexed, the foot will be found near the buttock, and can be seized and drawn down. If, on the other hand, the knees are extended, slip the fingers still further down the thigh, until the knee is reached ; and then, by pressure upon the anterior aspect of the leg just below the knee, the leg is made to flex upon the thigh, and so brought down. If the leg is got down, it diminishes the size of the presenting part, and gives a means by which to apply traction. We must take special care to get

below the knee before endeavouring to flex the leg, otherwise there is great danger of fracturing the femur.

If the leg cannot be brought down, owing to the breech having become impacted in the pelvic cavity, we must resort to traction upon the groin. With the patient in the same position, slip two fingers into the angle of the anterior groin, one above the other, and apply traction in the pelvic axis, at the same time trying to assist anterior rotation. By this means, the breech is brought sufficiently low to enable us to pass the fingers into the posterior groin; then, by pulling alternately on one and the other, the child is extracted. The power of the fingers, which are used to make traction on the groin, can be greatly increased by grasping the wrist firmly with the other hand during the traction.

If the impacted breech still resists our efforts, endeavour to pass a fillet of iodoform gauze over the anterior groin. This can be done as follows:—Take a small piece of double gauze about eighteen inches long and two inches wide, and rolled like a bandage. The free end of this roll is held in the left hand, and the roll itself is pushed upwards between the thigh and the anterior pelvic wall, in such a manner that, as it advances, it unrolls. As soon as it has been pushed above the angle of the groin, it is pushed inwards across the latter until it comes to lie between the thighs. Then, the fingers are pushed upwards from below between the thighs, and the roll of gauze caught and drawn downwards. If the first piece of gauze which was introduced is not sufficiently strong, a stouter piece can be knotted to one end of it and

drawn over the groin. Traction is then applied to the ends of the gauze, taking care that the gauze comes well down into the groin, and that there is no outward strain on the femur.

Another method of applying the gauze is by using a catheter as a *porte-fillet*. Take an ordinary No. 10 or 12 gum-elastic catheter with a strong stilette, thread it with a piece of stout sterilised silk or twine, and bend its upper end into a semicircle corresponding in size to the circumference of the thigh. Then, slip the catheter upwards anteriorly until the tip can be guided over the groin, and lies somewhere near the symphysis of the fœtus. Hold the stilette by the ring, and push the catheter itself gently upwards, and the curve which has been given to the stilette will guide the tip of the catheter downwards between the thighs, where it can be reached with the fingers. The end of the silk is caught and knotted to a piece of gauze, which is then drawn up to the eye of the catheter by means of the silk. The catheter and stilette are next gently withdrawn, and, at the same time, the gauze is carried over the groin.

If the child is dead, and extraction difficult, a cephalotribe may be applied to the breech ; or, if one is not at hand, the forceps tightly screwed up may be used instead. A blunt hook is a dangerous instrument for extraction. Even in skilful hands, it may break the femur of the child, or tear the femoral vessels ; whilst in unskilful hands, much damage may be done to the mother's soft parts. As soon as the breech of the child has passed the vulva, the case is managed like an ordinary breech presentation.

THE DELIVERY OF IMPACTED SHOULDERS.

The shoulders sometimes become impacted in the pelvis after the birth of the head, either owing to their size or to their failure to rotate. The treatment of this condition has been already discussed (*v.* page 450).

CHAPTER XXXIII.

CONSERVATIVE CÆSAREAN SECTION—RADICAL CÆSAREAN SECTION—PUBIOTOMY—SYMPHYSIOTOMY.

Conservative Cæsarean Section: Indications, Method—Radical Cæsarean Section: Indications, Operations—Symphysiotomy: Indications, Operation, After-treatment, Dangers—Pubiotomy: Indications, Operation, After-treatment, Dangers.

CONSERVATIVE CÆSAREAN SECTION.

Conservative Cæsarean section is the term applied to the operation by which the abdomen of the mother is opened, the uterus incised, the child extracted through the opening thus made, and the uterus stitched up, and replaced in the abdomen. It thus differs from radical Cæsarean section, sometimes called Porro's operation, in which, after the extraction of the child, the uterus also is removed.

Indications.—The indications for Cæsarean section may be divided into two classes :—

(a) **Absolute indications,**—in cases in which abdominal section is the only means by which the child can be delivered. These indications are :—

(1) Absolute pelvic contraction, *i. e.* below two and a quarter inches (5·5 cm.) in the true conjugate

in a flat pelvis, or below two and a half inches in a generally contracted pelvis.

(2) Solid irremovable tumours blocking the pelvis; as,—bony growths from the pelvic walls, myomata of the uterus, cancer of the cervix, or ovarian tumours.

(3) Extreme cicatrisation of any part of the vagina, sufficient to prevent it from being dilated without the rupture of other organs (Winckel).

(B) **Relative indications**,—in cases in which the child can also be delivered by some other operation, such as symphysiotomy, perforation, or induction of premature labour, and in which the adoption of Cæsarean section depends upon such circumstances as the period of pregnancy, the condition of the child, and the will of the mother. These indications are :—

(1) Lesser degrees of pelvic contraction, *i. e.* pelves which measure from $2\frac{1}{4}$ to $3\frac{1}{4}$ inches (5·5–8 cm.) in the true conjugate in a flat pelvis, and from $2\frac{1}{2}$ to $3\frac{1}{2}$ inches in a generally contracted pelvis, provided that the child is alive. In the case of a living child, when it is impossible to induce premature labour or to perform version or symphysiotomy.

(2) Partial obstruction from solid tumours as above, if the child is alive.

Method.—In a book of this size only a short outline of the operation can be given. It should be performed, if possible, after the patient has come into labour, but before the membranes have ruptured. There is then the least danger of post-partum hæmorrhage, owing to the presence of uterine contractions; and the uterine orifice will

be sufficiently dilated to allow free escape of the lochia during the puerperium. For the performance of the operation, four assistants are advisable;—one to give the anæsthetic, one to take charge of the infant after its extraction, and two to assist the operator. The steps of the operation are as follows:—

(1) Open the abdomen in the middle line by means of an incision eight inches (20 cm.) in length, one-third of which lies above the umbilicus, the remainder below; the uterus appears in the wound.

(2) Open the uterus in the centre of the presenting part by means of an incision six inches (15 cm.) in length, the edges of the abdominal wound being kept firmly pressed against the uterus by an assistant. If the placenta lies under the wound, it must be cut through.

(3) The child is rapidly extracted by the head, if the latter can be easily reached, if not by both feet. The cord is clamped and divided.

(4) The uterus is lifted out of the abdomen, and an assistant grasps the lower uterine segment tightly, as far down as possible, in order to check hæmorrhage.

(5) The placenta, membranes, and blood-clots are removed from the uterus, and the cervix is ascertained to be patulous, otherwise it must be dilated.

(6) The uterine incision is then stitched up by deep silk sutures. These traverse the entire thickness of the uterine wall, with the exception of the mucosa, and are passed at intervals of a centimetre ($\frac{2}{5}$ inch). Superficial sutures, including the peritoneum and a little of the muscular coat, may be inserted between the deep sutures if necessary.

(7) The peritoneal cavity is cleansed, and the uterus is replaced.

(8) The abdominal wound is sutured.

After-treatment.—The after-treatment of the case resembles that of any abdominal section. The abdominal sutures are removed on the eighth day; and, if all goes well, the patient is allowed out of bed at the end of a fortnight.

RADICAL CÆSAREAN SECTION.

The operation of radical Cæsarean section consists in the removal of the fœtus from the uterus in the manner just described, followed by the removal of the uterus either supra-vaginally or completely.

Indications.—Radical Cæsarean section is indicated instead of the conservative operation in the following cases :—

(1) If the uterus is defectively developed.

(2) If the uterus is the subject of some incurable disease, as cancer or myomata.

(3) If the patient suffers from osteomalacia.

(4) If we have reason to believe that the uterus has been infected with septic organisms during labour.

(5) It may be also indicated in bad cases of concealed accidental hæmorrhage (*v.* page 374).

Operations.—The preliminary steps of the radical operation down to and including the removal of the fœtus, are similar to those of the conservative operation. One of three forms of hysterectomy are then performed :—

(A) Supra-vaginal hysterectomy, with extra-

peritoneal treatment of the stump—the classical Porro's operation.

(B) Incomplete hysterectomy with retro-peritoneal treatment of the stump.

(C) Complete hysterectomy.

(A) **Supra-Vaginal Hysterectomy, with Extra-peritoneal Treatment of the Stump, Porro's Operation.**—Partial hysterectomy with extra-peritoneal treatment of the stump, or Porro's operation as it is usually termed, is now never performed, and need not be described.

(B) **Incomplete Hysterectomy with Retro-Peritoneal Treatment of the Stump.**—Incomplete hysterectomy with retro-peritoneal treatment of the stump is the operation of choice in all cases save when malignant disease of the uterus is present. It is performed in the same manner as in the case of a non-pregnant myomatous uterus.

(C) **Complete Hysterectomy.**—Complete hysterectomy is indicated in cases in which malignant disease of the cervix or body of the uterus co-exists with pregnancy; in cases of myomata which cannot be removed by a partial hysterectomy; and in cases in which there is sloughing or decomposition inside the uterus. The operation is performed in a similar manner to that adopted in the case of a non-pregnant uterus.

SYMPHYSIOTOMY.

The operation of symphysiotomy consists in dividing the ligaments of the symphysis pubis, and so allowing the separation of the innominate bones. As a result, all the diameters of the pelvis are increased (*v.* Fig. 185). This operation has been

almost universally superseded by pubiotomy, which will be described later (*v.* page 576).

Indications.—Symphysiotomy is indicated in contracted pelvis when the true conjugate measures from $2\frac{3}{4}$ to $3\frac{1}{4}$ inches (7—8 cm.) in length, if the induction of premature labour is out of the question. By dividing the symphysis an average separation of the pubic bones of about $2\frac{3}{5}$ inches (6·5 cm.) occurs, and this yields an increase in the true conjugate of three-fifths of an inch (1·5 cm.). Then, if the head comes through the pelvis in such a manner that one parietal eminence bulges into the gap, an additional gain of two-fifths of an inch (1 cm.) is obtained (*v.* Fig. 185). Assuming the bi-parietal diameter of the fœtal head to be $3\frac{3}{4}$ inches (9·5 cm.), and the average increase in the true conjugate to be one inch ($\frac{3}{5} + \frac{2}{5}$), it is plain that the minimum true conjugate that permits of symphysiotomy is $2\frac{3}{4}$ inches (7 cm.).

As much as $3\frac{3}{5}$ inches (9 cm.) separation of the pubic bones has been obtained with safety, yielding an increase in the true conjugate of a little over four-fifths of an inch (2 cm.).

Operation.—Four assistants are required;—one to assist the operator, one to give an anæsthetic, and two to control the separation of the innominate bones, which tend to spring suddenly apart the moment the symphysis is divided.

The end of the first stage of labour is the best time for the operation. Its steps are as follows:—

(1) An incision is made through the skin and subjacent tissues, starting about an inch and a half above the symphysis, and ending at the clitoris.

(2) An opening is made through the aponeurosis of the recti, sufficiently large to permit of the finger being passed behind the symphysis.

(3) The bladder and the other retro-pubic structures are separated from the back of the symphysis, and from the pubic bones, for a distance of two inches

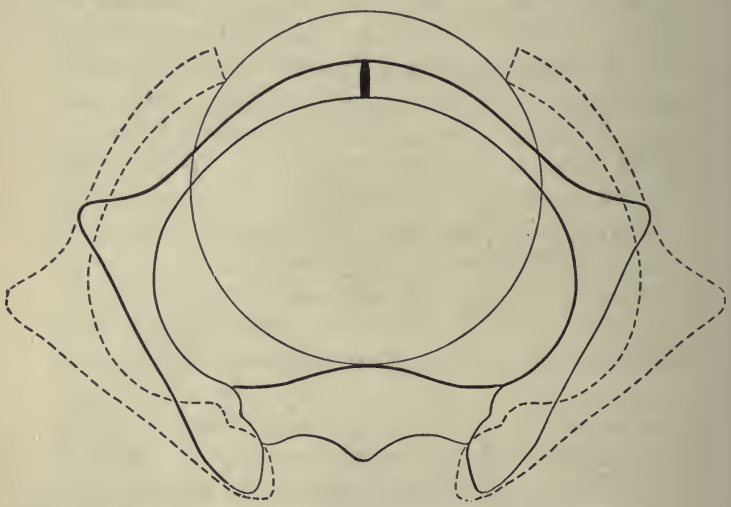


Fig. 185.—Diagram showing the increase in the diameters of the pelvis obtained by the division of the symphysis, and the manner in which the bi-parietal diameter of the head protrudes into the space between the pubic bones. (Galabin).

at each side. This is a most important part of the operation, as it prevents laceration of the urethra, etc., when the bones separate.

(4) The pubic ligaments are divided, from behind forwards, and from above downwards, the assistants taking every precaution to prevent the bones from springing asunder suddenly.

(5) The child is extracted by the forceps or by version.

(6) A piece of iodoform gauze is placed behind the separated bones, in order to prevent any of the soft parts from becoming nipped between them, and the end of it is brought out through the most dependent part of the wound.

(7) The skin and subjacent parts are brought together by deep silk sutures, which go right down to the bone and include the periosteum. As they are tied, the assistants press the pelvic bones again into contact.

(8) The iodoform gauze is then removed by pulling upon the end which hangs outside, and superficial sutures are inserted wherever necessary.

(9) The wound is dressed in the usual manner, and a tight binder fastened round the pelvis in order to keep the bones in contact.

After-treatment.—The patient must lie upon her back on a firm bed for three weeks. The catheter must be passed regularly, and the binder changed as often as it becomes soiled. The patient may usually be allowed out of bed in four weeks, but a pelvic binder must be worn for a year after the operation.

Dangers.—The dangers of the operation are :—

(1) Rupture of the urethra and bladder.
(2) Hæmorrhage from laceration about the clitoris.
(3) Rupture of the sacro-iliac articulations.
(4) Failure of the pubic joint to reunite.

PUBIOTOMY.

Pubiotomy, or hebotomy, is the term applied to the division of the pubic bone slightly to one or other side of the middle line, so as to allow an enlargement of the pelvic cavity similar to that caused by symphysiotomy. The advantages, which the operation possesses over symphysiotomy, are that the divided bone unites more rapidly than does cartilage, that there is not the same interference with the structures at the back of the symphysis, *i. e.* the urethra and the veins of the clitoris, and that, though it causes a similar increase in the size of the pelvic cavity as does symphysiotomy, there is no sudden springing apart of the divided bones, and therefore less risk to the sacro-iliac articulations.

Indications.—The indications for pubiotomy are practically identical with those for symphysiotomy, that is to say, the operation is indicated, in cases of flat pelvis, in which the true conjugate is not less than $2\frac{3}{4}$ inches (7 cms.), and in cases of generally contracted pelvis of not less than 3 inches, when the child is alive, and when the uterine contractions have failed to mould the head through the brim. Pubiotomy is also said to be indicated in face presentation when the chin rotates posteriorly and when efforts to correct the malposition have failed.

Preparation for Operation.—When the patient comes into labour, the usual disinfection of the field of operation is carried out, and a colpeurynter (*r.* page 313) is placed in the vagina, with the double object of preventing premature rupture of the membranes by supporting them, and of dilating the

vagina. As soon as the uterine orifice is fully dilated, the colpeurynter is removed and the membranes are ruptured.

Operation.—If it should be necessary to perform the operation, the following are the steps as recommended by Döderlein:—

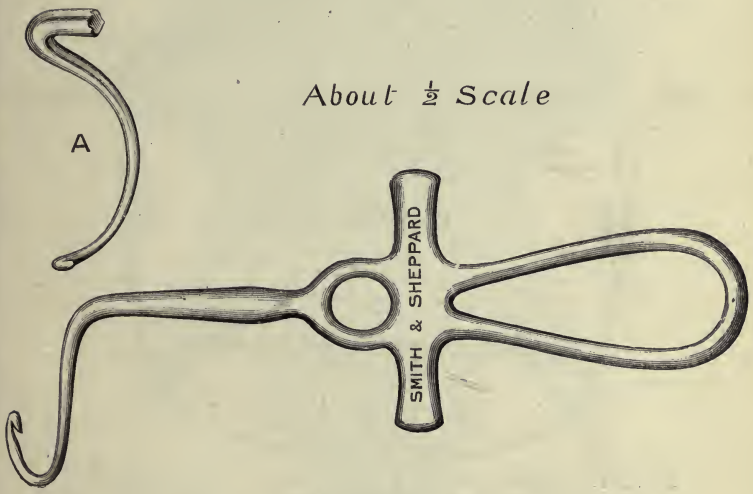


FIG. 186.—Döderlein's pubiotomy needle for introducing Gigli's saw. A. The curved portion of the needle.

(1) The patient is placed in the dorsal gynæcological position, and the legs are supported by rests or held by assistants. It is an advantage to have four assistants, but it is possible to perform the operation with two, one to give the anæsthetic and one to assist the operator. The field of operation is again disinfected and the bladder emptied.

(2) A transverse incision, large enough to admit the finger, is made just above the pubic bone on the

right or left side, and lying between the middle line and the left pubic spine. This incision is carried down to the upper margin of the bone, until it is possible to pass the finger behind the latter.

(3) The bladder and the other structures behind the bone are carefully separated with the finger introduced through the incision.

(4) Döderlein's needle (*v.* Fig. 186) is then passed

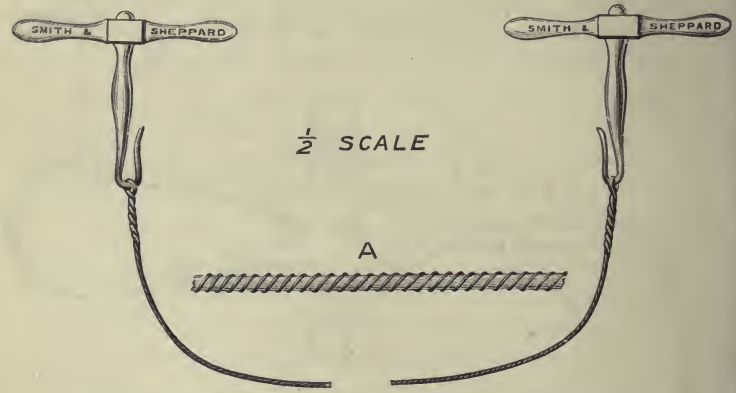


Fig. 187.—Gigli's wire saw, for pubiotomy. A. Enlarged view of the saw.

from above downwards behind the bone, to which it is kept as close as possible about a finger's breadth from the symphysis. Its course is guided by the finger in the vagina. As soon as it reaches the lower margin of the bone, the handle is depressed so that the tip bulges forward the skin of the labium majus. In order that the point may come out at the desired spot, the assistant draws the clitoris and labium well over to the opposite side.

(5) A small incision is made over the point of the

needle, to allow the latter to emerge. The point is pushed out and a Gigli's saw (*v.* Fig. 187) is attached and drawn back behind the bone as the needle

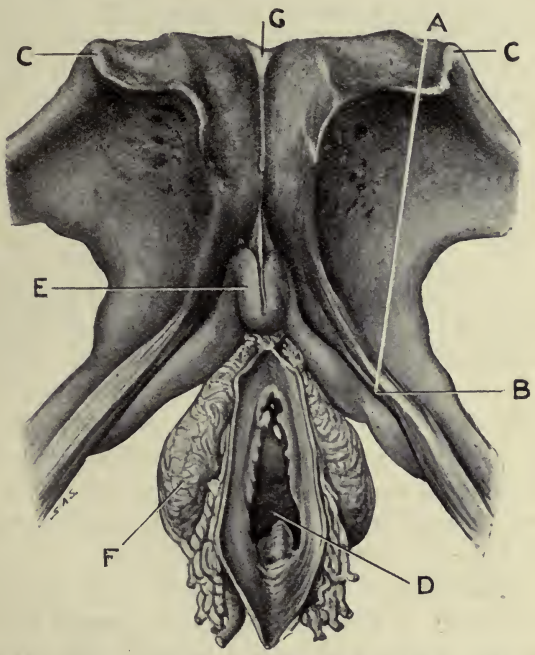


FIG. 188.—Front view of the symphysis and the pubic bones (Toldt), showing the line of incision, A B, in Döderlein's operation. G. Symphysis. C. Pubic spines. E. Clitoris. F. Vaginal bulbs. D. Orifice of vagina.

is withdrawn. The handles of the saw are then applied.

(6) The legs of the patient are then brought more closely together, and the assistants hold the sides of the pelvis so that they may separate gradually and gently when the bone is divided. The bone is

then divided, the handles of the saw being so held that the latter forms the arc of a large circle. From six to ten movements of the saw usually effect division, but it is well to be sure that division is complete before removing the saw. Some hæmorrhage follows its removal and comes from the corpus cavernosum, but it can usually be easily stopped by compression. In the rare cases in which the hæmorrhage does not stop, the superficial skin and fat must be incised down to the divided bone, and the bleeding vessels found and tied.

(7) The patient's legs are now allowed to hang down in Walcher's position (*v.* page 432), and, if possible, the head is pushed down through the brim. Döderlein advises to wait for spontaneous delivery, but, if it is thought inadvisable to wait, delivery may be effected by the forceps or after version.

(8) As soon as delivery is complete, the vagina is tightly plugged with iodoform gauze, the upper wound is closed by sutures, and firm compresses are applied over it and over the labia, so as to prevent the formation of a hæmatoma beneath the skin. A few strips of adhesive plaster are applied firmly round the pelvis, and then a binder. The vaginal tampon may be removed in eight hours.

This operation, like symphysiotomy, can also be performed subcutaneously, the incision being only just sufficient to admit the needle, which is passed, under the guidance of the finger in the vagina, without any preliminary separation of the retro-pubic structures. Döderlein's operation is, however, the more usual procedure.

After-treatment.—The patient must lie upon her

back for twelve days. As a rule she may get up on the fourteenth day, and she is able to walk a few days later.

Dangers.—Laceration of the vagina, communicating with the ends of the bone, is a serious complication, and most likely to occur when delivery is effected by the forceps or by version. Injury to the bladder may also occur, but usually heals quickly when a catheter is kept in. Among the last thirty cases reported by Kannegiesser, the maternal and fœtal mortality was *nil.* Laceration of the vagina communicating with the wound occurred five times, the bladder was injured once, and there were three cases of thrombosis of the femoral vein.

CHAPTER XXXIV.

CRANIOTOMY AND EMBRYOTOMY.

Craniotomy: Perforation, Evacuation, Compression, Extraction—Perforation in the Case of a Face Presentation, in the Case of an After-coming head—Embryotomy: Decapitation, Evisceration—Cleidotomy.

CRANIOTOMY.

By the term craniotomy is meant any cutting operation performed upon the head of the fœtus, with the object of reducing its bulk.

Indications.—As craniotomy of necessity implies the death of the child, it may only be performed under conditions of absolute necessity on the living child. The indications for the operation are as follow (Winckel):—

(1) If the child is dead, and if extraction of the undiminished head would be dangerous for the mother.

(2) If the child, in all probability, could not be extracted alive, and if such extraction would be dangerous for the mother.

(3) If the child is alive, and a relative indication for Cæsarean section, pubiotomy, or symphysiotomy exists (*v.* pages 571, 573, 576), but the mother refuses the operation.

Instruments.—The instruments which are required, and which are best adapted for craniotomy, are :— Simpson's perforator (*v.* Fig. 189) ; Winter's modification of Auvard's combined cranioclast and cephalotribe (*r.* Fig. 190); and a large-sized Bozemann's catheter.

Conditions.—Certain conditions must be fulfilled before the operation can be performed.

(1) The pelvis must not measure less than two and a quarter inches in the true conjugate in the case of a flat pelvis, and than two and a half inches in the case of a generally contracted pelvis. Ex-

Fig. 189.—Simpson's perforator.

traction of even a perforated head, through a smaller pelvis, is so dangerous that it should not be attempted.

(2) The uterine orifice must be sufficiently dilated to permit the necessary manipulations.

(3) The head must be fixed, or be held fixed by an assistant.

Method.—Place the patient—previously anæsthetised—in the cross-bed position. Palpate the abdomen carefully, and disinfect the vulva and vagina thoroughly in the usual manner.

The operation consists of four steps : —

(1) Perforation.

(2) Evacuation.

(3) Compression.
(4) Extraction.

(1) **Perforation.**—Introduce as much of the hand as is necessary into the vagina, pass two fingers inside the os, and touch the presenting part. Slip the locked perforator upwards, under guard of the fingers, and press it firmly and steadily through the centre of the presenting part, be it bone or suture. If this is done, and if the pressure is made perpendicularly to the surface against which it is applied, there is less risk of the instrument slipping. Then release the catch which locks the perforator, and press the handles together; this separates the blades, so making a longitudinal cut in the calvarium. Withdraw the instrument partially, turn it round through a right angle, and push it up. Again open the blades, so making another cut at right angles to the former one.

(2) **Evacuation.**—Push the perforator, through the opening thus made, down to the base of the skull, and, moving it about, break up the brain throroughly. Begin with the medulla oblongata in order to ensure the death of the child. Next, introduce the Bozemann's catheter, and douche out the fragments of the brain. If the latter has been first completely broken up, it can quickly be washed away.

(3) **Compression.**—Now take the combined cranioclast and cephalotribe. It consists of three blades:—a central or male blade, which resembles the male blade of an ordinary Braun's cranioclast, and two outside blades, both of which lock into the central blade. One of these outer blades locks with the central blade so as to form a cranioclast, the other

blade completes the cephalotribe. The instrument is also furnished with a strong screw, which can be adjusted so as to compress either external blade against the central blade. To use it, introduce the central blade into the interior of the cranium, and then pass one of the external blades upwards, in

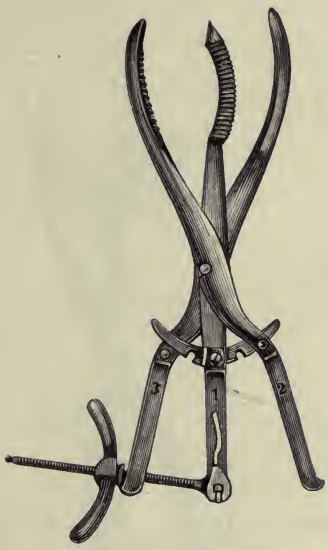


Fig. 190.—Winter's modification of Auvard's combined cranioclast and cephalotribe.

such a manner that it lies over the face of the child (*v.* Fig. 191). Take care that the central blade is so turned that its convexity points towards the external blade, as otherwise it would not have a firm grip upon the head. We have now a cranioclast upon the child's head, and, if the obstruction is not too great, the head can be delivered by it without using the

other blade. A cranioclast acts by elongating the evacuated head, and so reducing all its transverse diameters.

In some cases it may be necessary to reduce the size of the head still further, and this can be accomplished by the aid of the third blade.

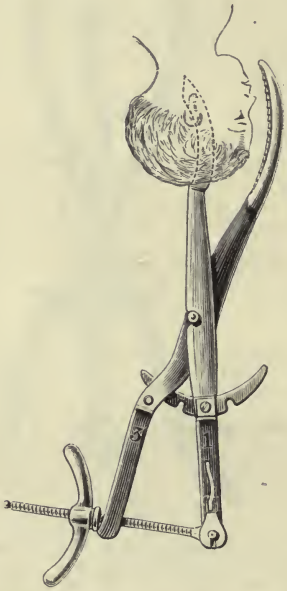


Fig. 191.—First step in the application of the combined cranioclast and cephalotribe.

Having applied the cranioclast over the face of the child, and tightened the screw until the catch can be fastened, introduce the third blade, so that it lies at the opposite side of the head to the cranioclast (*v.* Fig. 192). Lock it, and apply the screw to it.

Then tighten the screw until the handles come sufficiently close to enable the catch which holds the third blade to be fastened (*v.* Fig. 193). Always endeavour to grip the base of the skull with the tips of the outer blades.

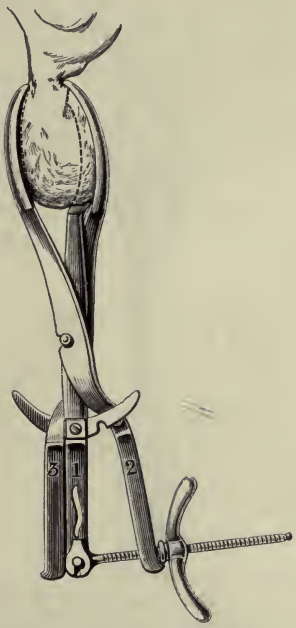


Fig. 192.—Second step in the application of the combined cranioclast and cephalotribe.

The great advantage which Auvard's instrument possesses is, that the head can be crushed without any fear of the cephalotribe slipping, as it is held firm by the previously applied cranioclast.

(4) **Extraction.**—Perforation should always be followed immediately by extraction. In many cases the

contractions of the uterus would, after a little time, expel the perforated head without assistance, but it is not wise to allow this to occur. In the first place, decomposition proceeds very rapidly inside a perforated head, and the patient may thus become

Fig. 193.—Final step in the application of the combined cranioclast and cephalotribe.

infected. In the next place, she has probably been allowed to remain undelivered as long as is safe, and therefore the uterus must now be emptied. Extraction is performed by means of the cranioclast or the combined instrument. In performing it the head should be rotated so as to imitate, as nearly as possible, the normal mechanism of labour.

In the case of a *face presentation*, endeavour to introduce the perforator through one of the orbits, and, failing that, through the roof of the mouth.

In the case of the *after-coming head*, the operation of perforation is sometimes difficult. The perforator may be introduced either into one of the lateral fontanelles, or into the occipital bone (Dührssen). If the former site is chosen, draw the body of the child forwards, and to one side, so that the lateral fontanelle descends. If the latter site is chosen, draw the body forcibly backwards, introduce the fingers of the left hand between the symphysis and the occiput of the child, and perforate at the highest point which is protected by the fingers (Dührssen).

EMBRYOTOMY.

Embryotomy is the term applied to any operation intended to reduce the size or shape of the child's body. It includes decapitation, evisceration, and cleidotomy.

Decapitation.—By decapitation is meant the separation of the child's head from the body at the neck.

Indications.—It is indicated in cases of neglected shoulder presentation, when version is either impossible or is contra-indicated, and in which the neck can be reached; also in cases of locked twins, when the after-coming head of the first has become interlocked with the fore-coming head of the second.

Instrument.—In neglected shoulder presentation, the best instrument for performing decapitation is Braun's blunt hook (*r*. Fig. 194). It performs the operation with ease, and with a minimum of danger

for the mother. Ramsbotham's sharp hook is also recommended for this purpose.

Method.—Place the patient, fully anæsthetised, in the cross-bed position. Introduce one hand into the vagina, and endeavour to encircle the neck from behind with the fingers. Next, pass the hook, under cover of the hand, upwards along the back of the child's neck; turn it, so that it lies over the neck of the child; and, finally, by a series of twisting movements, fracture the spinal column. Then, tear through or twist away the soft structures of the neck with

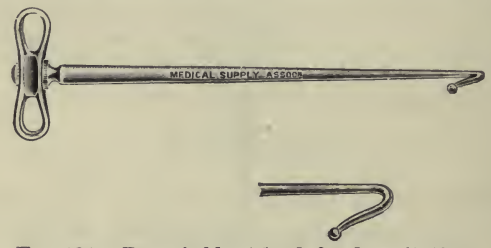


Fig. 194.—Braun's blunt hook for decapitation.

the blunt hook, or divide them with a pair of stout blunt-pointed scissors. Finally, draw down the arms, and extract the trunk by traction upon them.

The head is extracted last and may cause some trouble. The easiest method of extracting it is to pass the hand into the uterus, and two fingers into the mouth, and in this way to draw the head downwards, whilst an assistant at the same time makes pressure on the fundus. It may be necessary to perforate and crush the head, if the pelvis is contracted.

Evisceration.—Evisceration consists in making an

opening into the thorax or abdomen of the child, and through it removing some of the viscera.

Indications.—It is indicated if the size of the child's body obstructs delivery, or in the case of a neglected shoulder presentation, if decapitation is indicated but the neck cannot be reached.

Instrument.—Simpson's perforator, with which to make the necessary opening in the trunk, is all that is required. A pair of sharp-pointed scissors will answer equally well.

Method.—The patient must lie in the cross-bed position as before. Introduce the perforator into whatever portion of the trunk can be most easily reached. Make an opening sufficiently large to allow the hand or the fingers, according as is necessary, to be introduced. Seize any of the larger viscera that present, and tear them away. In this manner the liver, lungs and heart may be removed. When the size of the trunk is sufficiently reduced, fracture the spinal column, either by cutting it or by twisting it with Braun's blunt hook, and then extract the child by pulling down first the pelvis and lower limbs, then the trunk and arms, and lastly the head. If there are no instruments at hand for fracturing the spine, pass the hand into the uterus, seize the feet, and extract the child as a pelvic presentation.

Cleidotomy.—The operation of cleidotomy or division of the clavicles has lately been recommended as a substitute for evisceration in cases in which the size of the shoulders prevents delivery. From experiments upon dead children it has been found that division of one clavicle reduces the bis-acromial

circumference by from one to three centimetres, and that division of both clavicles reduces it by from three to four centimetres. In none of these experiments was the subclavian artery divided, or the subclavian muscle injured, so that it is possible that the operation may be justifiable in the case of a living child (Bonnaire).

Indications.—Cleidotomy may be indicated in impaction of the shoulders, when it is impossible to deliver the fœtus by traction even after the arms have been brought down.

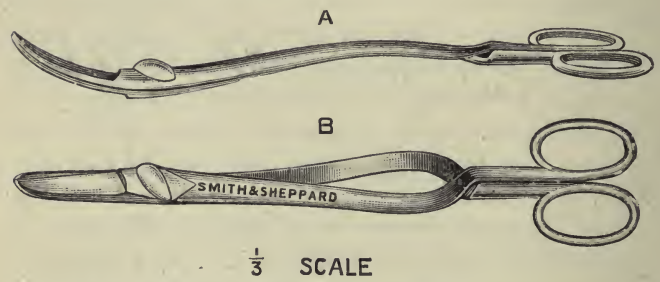


Fig. 195.—Long-handled scissors with double curve.

Instrument.—The only instrument required is a long and stout pair of scissors with blunt points (*v.* Fig. 195).

Operation.—The fingers of the left hand are passed into the vagina and the position of the clavicle is ascertained. The scissors are then passed upwards under cover of these fingers, and the clavicle is divided at or near its centre, taking care to include only the bone and the covering skin. The clavicle on the opposite side is similarly divided, if necessary. The fœtus can then be usually delivered by traction

on the arms and pressure on the fundus. If delivery is still impossible, further reduction of the shoulder girdle can be effected by dividing the skin over, and the posterior muscular attachments of, the scapulæ, as this enables the latter to move round anteriorly, so lessening the bis-acromial diameter.

CHAPTER XXXV.

THE INFANT—INFANT FEEDING.

Changes in the Infant after Birth—The Umbilical Cord—Temperature — Respiration — Pulse — Bowels — Urine — Weight — Breast Feeding—Artificial Feeding—Punctuality—Cleanliness—Suitable Food—Composition of Cow's and of Human Milk — Sterilisation of Milk, Pasteurisation — Farinaceous Foods.

CHANGES IN THE INFANT AFTER BIRTH.

The Umbilical Cord.—The changes which take place in the circulation of the infant at, and subsequent to, birth have been already described (*v.* page 36). The stump of the umbilical cord does not materially change during the first twenty-four hours after birth. Subsequent to this a line of demarcation begins to show itself, and the cord becomes progressively drier, brown, and mummified. It usually falls off between the third and sixth day. The umbilical arteries then gradually shorten, and the remainder of the cord is drawn like a plug into the umbilicus, which it completely fills, and so prevents the occurrence of an umbilical hernia (Winckel). The only essentials in managing the cord are to keep it dry and aseptic. It is usually

dressed after birth, and after each bath, as follows: —The cord is well dried, and then dusted with a powder consisting of equal parts of boracic acid and starch. Then, a piece of soft linen about five inches square is taken, and cut to the centre on one side. The linen is drawn round and beneath the cord from above downwards, so that the insertion of the cord lies at the centre of the linen. The cord is then drawn gently upwards, and allowed to lie on the piece of linen which is above the umbilicus. Lastly, each side of the linen is folded so as to envelop the cord. The infant's binder is then applied in the usual manner.

Temperature.—The usual temperature of the infant at birth is about 99·8° F. (37·6° C.). It falls a little after the first bath, and from that time on it is much the same as in the adult, and varies from 98·8° to 99° F. (37·1° C. to 37·2° C.). A temperature of more than 100° F. (37·7° C.), after the fourth day is an indication of the presence of some pathological condition (Winckel), and as will be subsequently mentioned, one of the symptoms of insufficient food, during the first few weeks, is a rise in the temperature.

Respiration.—When the infant is awake its respirations are usually irregular, and vary in rate between 30 and 60 per minute. During sleep, they are comparatively regular, and are slightly more frequent than when the infant is awake.

Pulse.—An infant's pulse is generally somewhat irregular, and is increased in rate by any excitement, such as crying, or while it is sucking. Its rate can be best determined while the infant is asleep. It may be counted by feeling at the wrist or over the

heart, or by watching the pulsations of the large fontanelle. The average pulse-rate during the first two months is 137 per minute, from the third to the sixth month 128 per minute, and from the seventh to the twelfth 120 per minute.

Bowels.—The motions of the infant during the first couple of days consist of the so-called meconium, a name derived from its resemblance to thick poppy juice (*μήκων*, a poppy). The meconium is composed of mucus from the small intestine, mixed with bile and desquamated epithelial cells. In from one to three days, the stools assume the usual yellow colour of an infant's motions. The usual number of stools is from two to three or four in the twenty-four hours; they are fluid in consistency, and slightly fæcal in odour.

Urine.—The urine of the new-born infant is slightly acid, of a pale yellow colour, and of a specific gravity of 1005 to 1007. It is passed from six to fifteen or twenty times daily. During the first two or three days after birth the daily quantity passed is from 3 to 12 drachms (10·5–42 c.cs.). It then gradually increases, until by the sixteenth or seventeenth day it is from 57 to 85 drachms (202·5–302 c.cs.).

Weight.—The average weight of an infant at birth is about seven pounds (3175 grms.). During the first two or three days, there is a loss in weight amounting to about half a pound (227 grms.). As soon as the cord has separated and commenced to cicatrise, the infant begins to regain its weight, and by the seventh or eighth day it is as heavy as at birth. From this time onwards, it should gain steadily in weight, and any failure to do so shows

that everything is not going on as it ought. In bottle-fed infants, it is particularly necessary to weigh the infant every week, in order to ascertain if it is receiving and assimilating its proper proportion of nourishment. The following table shows the average daily and monthly increase in weight of an infant, commencing with an initial weight of 7 lbs. 11 oz. (3487 grms.) (Fleischmann):—

Month.	Daily increase.	Monthly increase.	Weight.
	oz. drms.	oz. drms.	lb. oz. drms.
1st	1 3·7	37 0	9 14 0
2nd	1 2·0	33 14	11 15 14
3rd	0 15·8	29 10	13 13 8
4th	0 12·4	23 4	15 4 12
5th	0 10·1	19 1	16 7 13
6th	0 7·9	14 13	17 6 10
7th	0 6·7	12 11	18 3 5
8th	0 5·6	10 9	18 13 14
9th	0 5·6	10 9	19 8 7
10th	0 5·0	9 8	20 1 15
11th	0 4·5	8 7	20 10 6
12th	0 3·3	6 5	21 0 11

INFANT FEEDING.

The mother should always suckle her infant herself, unless there is some absolute reason to the contrary. In some cases, either for her own sake, or for the sake of the infant, it may be inadvisable for her to do so. She should not nurse her infant, for her own sake, if she is in a debilitated condition owing to previous hæmorrhages, phthisis, or any other wasting disease. She should not nurse the infant, for its sake, if she is suffering from any

disease which she may communicate to it, as recently acquired syphilis, or phthisis; also if her milk does not agree with the infant, or if her breasts are inflamed. Depressed nipples prevent the infant from sucking. This difficulty may be overcome by improving the nipples in shape, by drawing the nipples out two or three times a day with clean fingers, so as to elongate them and improve their shape. If the shape cannot be improved, a nipple shield may be used, or a *tetarelle* (*v.* Fig. 196). The latter is an apparatus by the aid of which the mother draws off the milk into a receptacle, from which the infant can

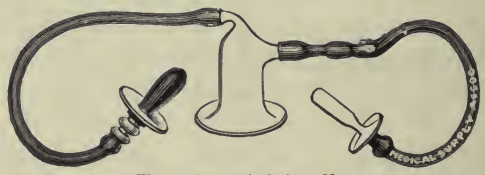


Fig. 196.—A tetarelle.

then suck it. If the mother can be induced to use it intelligently, and if it is kept clean, it is an excellent instrument. But usually these are insuperable difficulties.

If a mother cannot suckle her infant, a wet-nurse is the best substitute. However, it is so extremely difficult to obtain a suitable nurse, that bottle feeding is usually to be preferred. The following are the essentials for a wet nurse:—

(1) She must be perfectly healthy, and free from every disease which can be communicated to the infant.

(2) She must be between twenty and thirty-five years of age.

(3) Her breasts must be firm, with well-shaped nipples and contain abundance of milk.

(4) Her own infant must be about the same age as, or slightly older than, the infant she is going to nurse, and must be thriving well upon her milk. Also, she must be prepared to give up nursing it.

(5) Her character must be sufficiently good to allow of her being brought into the patient's house.

Artificial feeding has frequently to be resorted to. If it is properly carried out the infant will thrive well, but there are many difficulties in the due performing of it.

There are three essentials in feeding an infant:—punctuality, cleanliness, and suitable food.

Punctuality.—The infant must be fed at stated times. It must not be fed between these times, and if it is asleep at the hour for its food it must be awakened. The infant should be put to the mother's breast from three to four hours after birth, unless the condition of the mother forbids it. The objects of doing so are to cause increased contraction of the uterus, to allow the infant to obtain the benefit of the colostrum, and to assist in drawing out the nipples. If it is not done, the breasts become distended, and the difficulty which the infant naturally finds in obtaining a grip of the nipple is increased. For the first month, the infant is fed every two hours during the day, leaving one interval of four hours at night. From the commencement of the second month, the interval between the meals is gradually increased; until, at the end of the second month, the infant is being fed every two and a half hours, and at the end of the third month every three hours.

Cleanliness.—If the infant is breast-fed, the nipples must be washed with warm water before it is put to them. If the infant is bottle-fed, the bottle must be kept absolutely clean. A good bottle should be of the familiar boat shape, *i. e.* it should have no angles. The nipple should fit directly on to the mouth of the bottle, without the intervention of a tube. An excellent bottle is now made with an opening at either end, by means of which it can be thoroughly cleaned out. Immediately after feeding the infant, the bottle should be rinsed out with cold water, to which a little common rock salt has been added; then scalded with boiling water; and kept, when not in use, in a solution of soda and water. It must be thoroughly rinsed out in cold water before the milk is put into it. The rubber teat should have a little salt put into it, and then be well rubbed between the fingers and thumb, and finally washed out with plain water. When the infant is being fed, it should be taken by the nurse on her knee, and held there with one hand while the bottle is held with the other. As soon as the infant has taken what it wants, the remainder of the milk should be poured away.

Suitable Food.—If the infant cannot be fed on human milk, then the best substitute is cow's milk in some form.

The average composition of human milk and of cow's milk is shown in the following table, and side by side with it is placed, for purpose of comparison, the average composition of colostrum :—

	Colostrum.[a]	Human Milk.[b]	Cow's Milk.[c]
Proteids (caseinogen and lactalbumin)	5·71	1·50	4·00
Fat	2·04	4·00	3·50
Sugar (lactose)	3·74	7·00	4·30
Salts	0·28	0·20	0·70
Water	88·23	87·30	87·50
	100·00	100·00	100·00
Sp. gr.	1040—1046.	1010—1040.	1028—1033.
Reaction	Strongly alkaline.	Slightly alkaline.	Usually acid.

By reference to this table we find that cow's milk differs from human milk in containing more proteids, slightly less fat, and considerably less sugar. Not only does the quantity of proteids differ in the two milks, but also their quality. Cow's milk contains a larger quantity of albumen which is coagulable by an acid; consequently, when it is acted upon by the gastric juice, it tends to form a large firm curd. Human milk under the same conditions curdles in a flocculent mass, and so is more easily digested. The amount of proteid substances coagulable by an acid in cow's milk is about four times as great as the non-coagulable portion; while in woman's milk the non-coagulable portion is twice as great as the coagulable portion (Leeds). This is owing to the fact that in cow's milk there is more caseinogen than lactalbumin, while in woman's milk there is less. Further, cow's milk, as it is supplied to the consumer, is faintly acid and contains bacteria, whereas human milk is alkaline and contains no bacteria.

[a] Pfeiffer. [b] Pfeiffer, Kœnig, Leeds, and Harrington. [c] Holt.

We thus see that cow's milk must be considerably modified before it can be made a reliable substitute for human milk. First of all, the proportion of caseinogen must be diminished. This is done by adding a certain quantity of water, which of course still further diminishes the proportion of sugar and fat. These must now be increased by adding sugar and fat in some form. Milk-sugar, or lactose, is

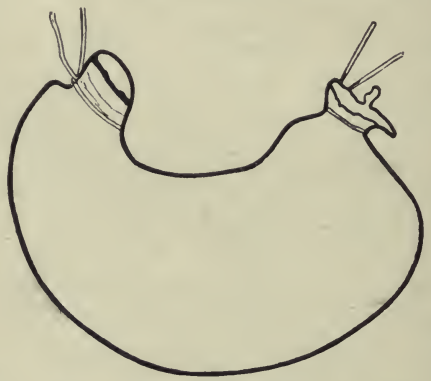


Fig. 197.—Outline of stomach of newly-born infant, actual size. (Holt.)

generally considered to be the best form of sugar to use, but in some cases it may be well to substitute Demerara sugar, as this counteracts any tendency to constipation on the part of the child. The amount of fat is increased by the addition of cream. If cream cannot be obtained, cod-liver oil may be administered separately. The proportion of fat in the milk of different herds of cows varies more than does the proportion of any other constituent of the milk. Moreover, the removal of some of the cream

from milk, before it is sold, is not an uncommon practice. Hence it is well—particularly if the child is not thriving—to ascertain the proportion of fat which the milk contains. A large deficiency in the amount of fat can be determined by taking the specific gravity. If the amount of fat is materially diminished, the specific gravity is raised. To ascertain the existence of slight degrees of excess or diminution in the amount of fat, a laboratory examination is necessary. Lastly, we must endeavour to cause the cow's milk to curdle in a flocculent mass, otherwise this method of feeding will fail. Barley-water, added to the milk instead of plain water, accomplishes this end.

In judging of the total quantity which is to be given at a meal, and of the respective proportions of milk and barley-water, we must be guided by the capacity of the infant's stomach, and by the analysis of normal breast milk at the different periods of lactation. The capacity of an infant's stomach is on an average at birth an ounce (28·4 c.cs.) (*v.* Fig. 197), at three months four and a half ounces (127·8 c.cs.), at six months six ounces (170·4 c.cs.), and at twelve months nine ounces (255·6 c.cs.) (Holt). The following table, based on Holt's excellent tables, shows the proportions of fat, sugar, and proteids which should be present in modified cow's milk, and the quantity of food required by an infant at different periods during the first year.

Table showing the proportions of fat, sugar, and proteids which should be present in modified cow's milk, and the quantity of food required by an infant at different periods.

Age.	Fat.	Sugar.	Proteids.	No. of feedings in the twenty-four hours.	Interval between meals by day.	No. of night feedings (10 p.m. to 7 a.m.).	Quantity at one feeding.	Quantity in twenty-four hours.
	Per cent.	Per cent.	Per cent.		Hours.		Ounces.	Ounces.
1st day . . .				4	6	1	1*	4
2nd day . . .				6	4	1	1—1·5	6—9
3rd—7th day .	2·0	6·0	0·60	10	2	2	1·5—2	15—20
2 to 4 weeks .	2·5	6·0	0·80	10	2	2	2—2·5	20—25
1 to 3 months .	3·0	6·0	1·00	8	2½	1	3—4·5	24—36
3 to 5 months .	3·5	6·0	1·25	7	3	1	4—5·5	28—38
5 to 9 months .	4·0	7·0	2·00	6	3	0	5·5—7	33—42
9 to 12 months .	4·0	6·0	2·50	5	3½	0	7·5—9	38—45

* One ounce is equal to 28·4 c.cs.

The next table shows a simple method of obtaining the required proportions of the different constituents. The correct quantity to give at each feeding will be found in the preceding table :—

Age of infant.	Gravity cream (16 per cent.).	Plain milk	Milk-sugar.	Barley-water.
	Drachms.	Drachms.	Teaspoons.	Drachms.
3rd—14th day.	2½	1½	1½	20
2—4 weeks.	3	2	1½	19
1—3 months.	4	2	1½	18
3—5 months.	4	5	1½	15
5—9 months.	4	8	1½	12
9—12 months.	3½	12	1½	9½

Even after the relative proportion of the ingredients of cow's milk have been altered so as to make it resemble human milk, a most important point of difference between the two still remains, *i. e.* that there are always swarms of micro-organisms in cow's milk as the consumer gets it. These must be got rid of in some manner. The most obvious method is to boil the milk. There are, however, great objections to this, as it renders the milk less nutritious, and more difficult to digest, and causes constipation. On the other hand, it is generally believed that the nutritive properties of milk are only very slightly affected by the application of any heat short of the boiling-point of milk. On this hypothesis is founded the method of sterilising milk recommended by Budin, of Paris. This method consists in placing the required amount of milk in a bottle which is three-quarters immersed in water. The latter is raised to boiling-point, at which it is kept for forty minutes. The bottle of milk is then

removed and rapidly cooled. This continued heat is sufficient to effect the necessary sterilisation. The most convenient form of apparatus for carrying out this process is that devised by Soxhlet, and is shown in Fig. 198. By its means, a number of bottles, each containing sufficient for one feeding, can be prepared at one time, and are kept from subsequent contamination by means of a small rubber cap, which is sucked into the mouth of the bottle as the contents cool.

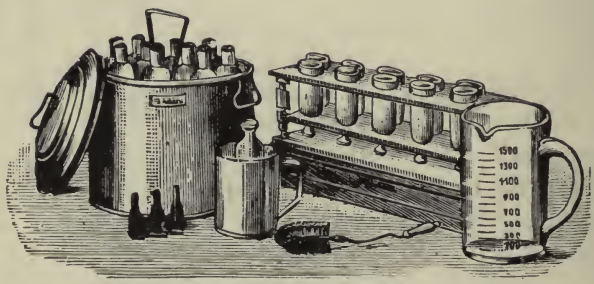


Fig. 198.—Soxhlet's milk steriliser.

Budin stated, further, that milk thus sterilised does not require to be diluted; in fact, that infants thrive considerably better on undiluted than on diluted milk. Our own experience is that infants thrive admirably on a suitable mixture of barley-water and milk prepared as has been described above, and then sterilised for thirty or forty minutes in boiling water. We have not found them do well on undiluted sterilised milk.

Another method of destroying micro-organisms is by *"Pasteurising"* the milk. This consists in raising it to a temperature between 158° F. and 176° F.

(70–80 C.), and keeping it at this temperature for thirty to forty minutes. This method will destroy the greater number of bacteria and spores, but not all.

In many cases alterations must be made in the standard dietary, which has been given above, in order to suit the special requirements of the infant, and to ascertain the nature of these alterations the effect of the food that is taken must be carefully watched. If the child possets up unchanged milk, it is getting too much fluid. If it passes undigested curds, the milk is too strong. If it digests its food well, but seems always to be hungry, it may get more fluid with proportionately less barley-water, or, if that disagrees, a larger quantity of the usual mixture.

Too little sugar causes a slower gain in weight than is normal; too much sugar causes colic, and also perhaps thin green stools (Holt). Too little fat causes hard dry stools; too much fat causes vomiting or regurgitation of food and frequent motions, which sometimes contain whitish lumps composed of fat (Holt). Too much proteid matter causes curds in the stools, colic, sometimes diarrhœa, but more usually constipation. The following symptoms show that the child is not receiving sufficient nourishment :—

(1) During the first three days the temperature shows an inclination to rise; it ranges about 101°-102° F. (38·3–38·8° C.), and may even reach 104° F. (40° C.) or more. This is the so-called inanition fever (Holt).

(2) The infant ceases to gain in weight.

(3) The infant draws the breast for a long time before it is satisfied. If the breast milk is abundant, five to ten minutes ought to be sufficient to satisfy it; if the milk is deficient it may require half an hour or more.

(4) Its sleep is irregular and disturbed, and when awakened it frequently cries.

(5) The stools are irregular and of an unhealthy appearance.

Farinaceous foods containing starch should never be given to young infants, as the secretions by which starch is digested, *i. e.* the saliva and the pancreatic juice, are not fully established until the child is six months old. Condensed milk, and prepared foods in which the starch has been changed into sugar, are sometimes of considerable use during the first two or three months of the child's life, especially if there is a difficulty in obtaining the due sterilisation of the milk. The objection to continuing their use for a longer period as the sole food is that they almost all contain too much carbohydrate, and too little nitrogenous matter. As a result, infants so fed become large and fat, but have not sufficient development of bone and muscle.

CHAPTER XXXVI.

INFANTILE DISEASES.

Asphyxia Neonatorum: Schultze's Method of Artificial Respiration — Cephalhæmatoma — Convulsions — Green Diarrhœa — Icterus Neonatorum — Late Hæmorrhage from the Cord — Mastitis — Ophthalmia Neonatorum — Retention of Urine — Strophulus — Thrush.

ASPHYXIA NEONATORUM.

Infants are frequently born asphyxiated after protracted labour, or when a malpresentation occurs, especially if it is a breech.

Degrees.—There are two degrees of asphyxia:—

(1) *Asphyxia pallida,* or white asphyxia.

(2) *Asphyxia livida,* or blue asphyxia.

The worse form of asphyxia is asphyxia pallida. In it, the infant is white when born, the cord is not pulsating, the heart can scarcely be felt, there are no attempts at respiration, and all reflexes are lost. In asphyxia livida, the infant is blue, the cord pulsates, the heart beats strongly, there are slight attempts at respiration, and the reflexes are present. In order to feel an infant's heart, press the fingers up under the arch of the ribs, a little to the left of the sternum. It is then easily felt if it is beating.

Treatment.—To treat an asphyxiated infant successfully a regular line of action must be laid down and carried out in due order, paying the greatest attention to details. If the infant is born in white asphyxia,—

(1) Tie and divide the cord.

(2) Place the infant in a bath of water at 100° F. (37·7° C.)

(3) While it is in the bath, suck the mucus out of the trachea with a silver or gum-elastic catheter.

(4) Take the infant out of the bath and dry it thoroughly.

(5) Perform Schultze's method of artificial respiration (see below) five or six times.

Repeat steps (2) to (3) over and over again until either the infant dies, *i. e.* its heart stops, or until it passes into the stage of asphyxia livida. As soon as this occurs we may assume that its reflexes have returned, and may endeavour to stimulate them. To do this, after taking the infant out of the hot bath, plunge it for a moment into a cold bath; then "Schultze" as before. Continue this routine,—hot bath, aspiration of mucus, cold bath, dry, "Schultze," until the infant commences to make strong efforts at respiration. Then, if there is a fire in the room, make the nurse sit down in front of it, and roll the infant on her knees. To do this, she places the infant across her knees on its side, and then rolls it half over on to its face, at the same times compressing the ribs. This causes expiration. She then rolls it in the opposite direction on to its back, at the same time removing all pressure from the chest, and pulling upon the arm which is uppermost, in such a way as

to draw the ribs upwards. This causes inspiration. It is also a good thing to rub a few drops of whiskey on the gums and chest of the infant. An infant in white asphyxia must not be placed in a cold bath, as it depresses the heart dangerously.

Fig. 199.—Schultze's method of performing artificial respiration. Completion of the inspiratory movement.

Schultze's method of artificial respiration is performed as follows* :—Seize the infant in both hands, the thumbs hooked beneath the heads of the humeri,

* This description differs slightly from the original description of Schultze. He recommended to hook the index fingers, and not the thumbs, under the axillæ of the infant, thus avoiding the necessity of changing the grip.

the index fingers along the sides of the thorax, the other three fingers along the back (*v.* Fig. 199). Then raise the infant with a quick sweep through the air until its body rolls forward upon your thumbs, which are now placed on the anterior aspect of the chest (*v.* Fig. 200) ; and, at the same time, compress the chest laterally with the index fingers and posteriorly with the other fingers, so diminishing its lateral and

Fig. 200.—Schultze's method of performing artificial respiration. Expiration.

antero-posterior diameters. Owing to the position of the infant, the abdominal viscera fall towards the diaphragm, forcing it upwards, and in this way diminish the vertical diameter of the chest. This movement causes expiration, and the inverted position favours the flow of mucus out of the trachea. Having kept the infant for a couple of seconds in this position, it is then swung forwards again into a vertical position. As the infant falls forward all compression is removed from the chest, and the infant

is held by the shoulders, so that, as it falls, its weight causes the ribs to be drawn upwards (*v.* Fig. 199). This movement causes inspiration. The rate of inspiration ought to be from eight to twelve in the minute. It is important to note any attempt at inspiration which the infant may make, and to time our movements so as to synchronise with the attempt.

If the infant is born in a state of asphyxia livida, the cord must not be tied until it has ceased pulsating. As soon as this occurs, it is tied, and the infant treated as described.

CEPHALHÆMATOMA.

Cephalhæmatoma is the term applied to an extravasation of blood, which sometimes forms, after labour, under the periosteum subjacent to the caput succedaneum. It is due to the rupture of a vessel during delivery. At first, it consists of a more or less tense and slightly fluctuating tumour, and it is limited in extent by the sutures which surround the bone over which it forms. As the blood coagulates, the periphery of the swelling becomes as hard as bone, while in the centre there is a depression, and, consequently, at this stage, it feels as if there were an opening through one of the bones into the skull. A cephalhæmatoma should not be interfered with unless it suppurates, and then it must be opened and drained.

CONVULSIONS.

Convulsive attacks of a greater or less degree of

intensity and frequency are by no means uncommon in early infant life.

Ætiology.—Convulsions must be regarded as the symptoms of the presence of a definite pathological condition, and not as a disease in themselves. Their relative frequency in infancy is due to the instability of the nerve-centres in the cortex of the brain at this period of life, an instability which renders them more prone to excessive response to slight stimuli than is the case at later periods of life. Three sets of pathological conditions are the most frequent causes of convulsions (Holt):—

(1) Direct irritation of the cortex of the brain.
(2) Reflex irritation of the cortex of the brain.
(3) Toxic influences affecting the cortex of the brain.

In the first of these classes are included the various forms of cerebral disease—meningitis, tumours, embolus, and the like. In the second class, are included severe injuries, prolonged retention of urine, the presence of undigested food in the intestinal tract, sudden application of extreme cold to the body, dentition, etc. In the third class, are included the various causes of auto-intoxication, as intestinal decomposition of food—perhaps the commonest cause of convulsions in young infants, suppression of urine, and asphyxial conditions. It will be seen that such an ætiology of convulsions as we have given closely resembles the suggested ætiology of eclampsia (*v.* page 322). And, practically, perhaps, convulsions in the infant may be regarded as the equivalent of eclampsia in the pregnant woman.

Symptoms.—The occurrence of a convulsion in an

infant is denoted by twitching of the muscles of the face and eyes, rigidity of the body, clenching of the fists, and slight frothing of the mouth, and is associated with feeble and shallow respiration, feeble action of the heart, and a resulting pallid or cyanotic appearance of the infant. The attack may be single, or repeated attacks may rapidly follow one another. Death may occur as the result of a single attack, in which case it is probably due to cerebral or meningeal hæmorrhage, or to asphyxia. More commonly, however, death is caused by inanition due to the force and frequency of the attacks.

Treatment.—The infant should be immediately placed in a hot bath (100° F., 37·7° C.) for about five minutes, and cold at the same time applied to the head with the object of lessening the cerebral congestion. This is most easily done by applying to the head a sponge or handkerchief wrung out of cold water. After about five minutes, the child is removed from the bath, quickly dried with a warm towel, and wrapped in a soft woollen garment. It should then be disturbed as little as possible. The cause of the convulsion must also be removed, as far as possible. If the convulsions are not checked by means of a hot bath, sedatives should be administered. Bromide of potash (grs. 2—3) and chloral (grs. 2—3) are most usually chosen, and are repeated every couple of hours until the convulsions cease. They may be given in enemata if necessary, indeed, if the infant is unconscious they must be given in this manner. As has been mentioned, in the majority of cases the convulsion will be found to be the result of intestinal intoxication, *i. e.* poisoning by the absorp-

tion of toxins from the intestinal canal. Accordingly, the treatment proper for this condition must also be adopted—purgatives and intestinal antiseptics. Stimulants are also administered if the action of the heart is enfeebled, and, in cases where cyanosis is marked and prolonged, the inhalation of oxygen has been followed by good results.

GREEN DIARRHŒA.

Diarrhœa, in the infant, consists in the passage of more than six stools in the twenty-four hours. The normal motions of an infant are yellow in colour, liquid in consistency, and slightly fæcal in odour.

Ætiology.—Green diarrhœa is due to the entrance of bacteria into the infant's stomach. They gain access in the food, most usually in sour milk. The green colour of the stools is due to the presence of biliverdin (Wegscheider), owing to the imperfect oxidation of the bile, or, according to some writers, to the formation of a green pigment by certain bacteria.

Symptoms.—The diagnostic symptom is the passage of green motions, and masses of foul-smelling, semi-digested curds. If the case is allowed to remain untreated, gastritis results, which may extend downwards into the intestines. The child then becomes marasmic, as it is unable to assimilate its food, and dies of starvation.

Treatment.—The prophylactic treatment consists in giving the infant milk which is free from bacteria, and in keeping its bottles perfectly clean. If green diarrhœa occurs, the indication is to clear the curds

out of the stomach and intestines. The administration of a teaspoonful of castor oil will usually be found to be sufficient, if the case is taken in time. Sometimes, however, this will not suffice, and then more radical measures must be taken. The food may be changed, and one or other of the various proprietary foods substituted. If this does not relieve the symptoms, it is sometimes well to feed the infant for a few days on raw beef juice and barley-water only. By this means the bacteria are starved out, so to speak, as the majority of them can exist only on milk. At the same time small doses of calomel (gr. $\frac{1}{3}$), or grey powder (gr. $\frac{1}{2}$—1) combined with salol (gr. $\frac{1}{4}$—1), may be given and repeated if necessary every six to eight hours. After all offensive matter has been cleared out of the intestines, small doses of Dover's powder (gr. $\frac{1}{3}$) may be given every three or four hours to check further diarrhœa. This treatment is continued for two or three days. Then, if the diarrhœa has ceased, the infant may return to its ordinary diet. If the infant is very weak and marasmic, it requires some stimulant. This is best given in the form of white wine whey, very dilute whiskey and water, or equal parts of champagne and water.

ICTERUS NEONATORUM.

Icterus neonatorum, or infantile jaundice, occurs as a symptom in three conditions :—

(1) Physiological or simple icterus occurs in a considerable number of infants. It is variously stated to be hæmatogenous and due to the destruction of large

numbers of red blood-corpuscles after birth, as a result of which a quantity of blood-pigment is set free; or to be hepatogenous and due to the resorption of bile from the capillary bile-ducts. In the latter case, the cause of the resorption is said to be a temporary stasis of bile in the capillary ducts, due to the compression of the ducts by the dilated branches of the portal vein and blood capillaries.

(2) Severe or septic icterus occurs in cases of inflammation of Glisson's capsule, the latter being usually due to extension of inflammation from the umbilicus.

(3) Icterus also occurs due to congenital diseases, as syphilis or malformation of the liver.

Treatment.—In simple icterus the infant requires no special treatment. A mild laxative, such as glycerine (15—30 minims), may be given in order to clear out the digestive tract. In septic icterus the prognosis is very bad. Any septic condition of the umbilicus must be treated with antiseptic compresses or iodoform powder. The infant should be also given stimulants.

LATE HÆMORRHAGE FROM THE CORD.

Late or secondary hæmorrhage from the cord may occur at any time during the fortnight subsequent to delivery.

Ætiology.—It may be due to syphilis, hæmophilia, acute fatty degeneration, and hæmoglobinuria (Winckel); but the commonest cause is ulceration of the umbilicus due to septic infection.

Treatment.—Such hæmorrhage is extremely difficult to check, and is, in most cases, fatal. Perchloride

of iron, ligation of the entire umbilical ring, plugging of the umbilical fossa with plaster of Paris, and pressure of all kinds have been tried without avail. The method most usually recommended consists in attempting to underpin the umbilical vessels with a stout needle, and then compressing them against the needle by passing a figure-of-eight ligature beneath its projecting ends.

MASTITIS.

The occurrence in the breasts of a newly-born infant of either sex of a small amount of a fluid resembling colostrum is by no means an uncommon condition. The mammary gland of the new-born has been shown to contain cul-de-sacs lined by secreting cells somewhat similar to those in the adult female. The secretion of this fluid in itself is of no importance, except that it sometimes leads to ill-advised interference on the part of the nurse or mother, who rubs the breasts with the object of softening them. In consequence of this, infection not infrequently follows, with the result that an abscess is formed.

Treatment.—If the breasts are swollen and secrete milk, all that is necessary is to protect them from pressure by the application of a pad of wool. If the secretion of milk is abundant, they may be painted with a little tincture of belladonna. If an abscess forms it must be opened at the earliest moment by means of a small radial incision, and the sac drained by inserting a piece of iodoform gauze. If this is done, the breast rapidly gets well.

OPHTHALMIA NEONATORUM.

Ophthalmia neonatorum is an infectious disease of the eyes, with which the infant may become inoculated most frequently during the passage of the head through the vagina, more rarely subsequently to delivery.

Ætiology.—It is almost always due to the entrance of the gonococcus into the eyes, usually during the passage of the head through the vagina. It has, however, occasionally been found to have resulted from the entrance of other forms of bacterium, such as the pneumococcus and the colon bacillus.

Symptoms.—The symptoms commence two days after birth, *i. e.* after infection. The eyelids become swollen and inflamed, and a purulent discharge flows from between them. In severe cases, opacities or even ulcers of the cornea may form, and so partial or complete loss of vision result.

Treatment.—Prophylactic treatment should be adopted as a routine in hospitals, also occasionally in private practice, wherever there is any reason to suspect gonorrhœal infection in the mother. It consists in wiping the eyes of the infant carefully with a soft rag the moment the head is born, and then in dropping in two drops of a one per cent. solution of nitrate of silver or the same quantity of a twenty per cent. solution of argyrol, or a ten per cent. solution of protargol. We prefer one or other of the two last, as they do not cause temporary irritation as does nitrate of silver.

If the infection occurs, our treatment must be more active. The eyes must be well washed with

warm boric lotion five or six times a day, the lids being separated, so as to allow the pus to flow out. At the same time, two drops of a two per cent. solution of nitrate of silver are dropped into the eyes once a day, and they are kept carefully bandaged. Sydney Stephenson recommends the use of a fifty per cent. solution of protargol instead of nitrate of silver, or of a twenty-five per cent. solution of argyrol applied from one to four times a day according to the severity of the case. The greatest care must be taken to avoid spreading the infection by means of dirty fingers or cloths. If only one eye is infected, the sound eye must be treated with the weaker solution of nitrate of silver or argyrol, and must also be protected from the infection by a hermetic bandage. To do this, apply a small piece of lint spread with boracic ointment to the eye, then a pad of cotton wool, and cover the whole with strips of lint soaked in collodion (Swanzy).

RETENTION OF URINE.

Retention of urine sometimes occurs in infants of both sexes during the first twenty-four hours after birth. On this account, it is always the duty of the medical attendant to enquire in the course of the first visit after the confinement, if the infant has passed water or not.

Ætiology.—The commonest cause of retention of urine is the blockage of the orifice of the urethra by a small plug of vernix caseosa. In the male infant this plug will be found under the prepuce, in the female between the labia.

Treatment.—Examine the orifice of the urethra to discover if there is any obstruction apparent, and carefully wash away all vernix from the neighbourhood. If the infant still does not pass water, apply a warm stupe to the lower part of the abdomen, and if this fails immerse it in a hot bath, and allow it to remain in the water for a short time. By holding the hand in front of the urethral orifice, it will be possible to tell if the infant passes water or not. The administration of a couple of teaspoonfuls of cold water, while the infant is in the bath, is said to assist in causing micturition. If all these means fail, and the bladder is distended,—as determined by palpation and percussion of the abdomen, a catheter must be passed. There is usually no difficulty in passing a No. 1 or 2 catheter in the case of a male infant, or a small-sized glass female catheter in the case of a female infant.

STROPHULUS.

Strophulus, miliaria rubra, or gum is the name applied to a common rash of early infant life. It is usually caused by too much clothing, or too prolonged warmth of any kind applied to the body of the infant. Thus, it is seen on the side of the face on which the infant sleeps, and on the side of the body which is pressed against the mother when nursing—if the latter is only done with one breast (Holt). The effect of too great warmth is to cause excessive action of the sweat-glands, and this is followed by a small area of inflammation round their mouths. This inflammation results in a blockage of the ducts

of the glands, and hence in the formation of numerous tiny retention cysts. The appearance of the rash is quite characteristic. It consists of scattered red papules, with a small yellowish speck in the centre—the mouth of the obstructed gland, or sometimes of minute vesicles, or even pustules. It lasts for from two to six days, and then gradually disappears.

Treatment.—Remove any cause which may tend to promote excessive action of the sweat-glands, and apply a dusting powder, such as starch and boric acid.

THRUSH, OR STOMATITIS MYCOSA.

This is another disease which results from impure milk. It consists in the formation of small white spots on the mucous membrane of the mouth and tongue.

Ætiology.—Thrush is directly due to the implantation of a fungus, *Oidium*, or *Saccharomyces, albicans*, on the mucous membrane of the mouth. The Oidium is found in impure milk, and the infant may become infected from milk which has decomposed upon the mother's nipple, or in a dirty bottle.

Symptoms.—Small white spots, consisting of colonies of the fungus, appear on the mucous membrane of the mouth. If untreated, the spots coalesce and form a species of false membrane, which may extend into the pharynx and œsophagus. Green diarrhœa is frequently associated with this condition.

Treatment.—The prophylactic treatment consists in washing the mother's nipples before the infant takes the breast; in having the bottle perfectly

clean, if the infant is bottle-fed; and in carefully wiping the mouth of the infant with a soft rag, after it has had its food. If thrush occurs, treat it at once. Wash the inside of the mouth with warm water and a soft rag, and place a teaspoonful of equal parts of glycerine of borax (B.P.), and of water in the infant's mouth, twice a day. This acts as an antiseptic, and destroys the fungus.

APPENDIX I.

The first of the following tables shows the nature and the proportion of the cases treated in the Rotunda Lying-in Hospital during the masterships of Sir W. J. Smyly and of Dr. R. D. Purefoy, and the first three years of the mastership of Dr. E. H. Tweedy. The second table shows the number of deaths that have occurred during the same period, and their cause. The third table shows a classification of the causes of these deaths. The fourth table shows the infant mortality for the last ten years.

TABLE A.—*Showing the Nature of the Cases treated in the Rotunda Lying-in Hospital.*

	Master—W. J. Smyly 1889–1896.	Master—R. D. Purefoy 1896–1903.	Master—E. H. Tweedy.			Total.	Average.	Number of deaths.	Percentage of deaths.c
			1903–4.	1904–5.	1905–6.				
Total number of labours	8997	11098	1887	1904	1904	25,790			
Vertex presentations	8376	10199	1767	1804	1792	23,938	1 in 1·04*a*	—	—
Face ,,	23	30	2	2	4	61	1 in 408·49*a*	—	—
Brow ,,	15	15	2	2	5	39	1 in 638·92*a*	—	—
Pelvic ,,	281	396	56	51	35	819	1 in 30·42*a*	—	—
Cross-births	20	33	5	6	2	66	1 in 377·54*a*	—	—
Twins	111	150	16	32	23	332	1 in 77·68*a*	—	—
Triplets	2	2	—	—	—	4	1 in 6447·5	—	—
Hyperemesis	6	9	1	2	3	21	1 in 1228·09	4	19·04
Vesicular mole	6	6	2	—	1	15	1 in 1719·33	1	6·66
Hydramnios	26	83	7	8	7	131	1 in 196·87	—	—
Abortions	282	425	60	39	66	872	1 in 29·57	—	—
Placenta prævia	55	53	4	3	6	121	1 in 213·14	1	0·82
Accidental hæmorrhage	74	92	13	8	6	193	1 in 133·62	10	5·17
Post-partum hæmorrhage	120	199	29	19	15	382	1 in 67·51	2	0·52
Secondary post-partum hæmorrhage	9	17	2	—	1	29	1 in 889·31	—	—
Hæmatoma of vulva	2	8	3	1	—	14	1 in 1842·14	—	—
Eclampsia	33	23	8	12	8	75	1 in 343·86	17	22·66
Rupture of uterus	5	8	1	1	—	15	1 in 1719·33	11	73·33
Myoma of uterus	14	56	3	6	4	83	1 in 310·72	—	—
Insanity { Mania	11	28	2	2	3	46	1 in 560·65	3	6·52
Insanity { Melancholia	2	3	—	—	—	5	1 in 5158	—	—
Pulmonary embolus	1	5	—	—	—	6	1 in 4298·33	5	83·33
Induction of labour	26	36	5	3	11	81	1 in 318·39	—	—

Manual removal of placenta	91	168	36	26	20	131	1 in 196·87	—	—
Forceps	267	432	65	82	51	327	1 in 78·86	—	—
Version	79	70	9	10	11	179	1 in 144·07	—	—
Craniotomy	12	9	1	—	—	22	1 in 1172·27	—	—
Decapitation	1	2	—	—	—	3	1 in 8596·6	—	—
Cæsarean section	3	4	1	4	1	13	1 in 1983·84	3	23·07
Post-mortem section	—	1	—	—	—	1	1 in 25790	—	—
Symphysiotomy	4	—	1	—	—	5	1 in 5158	—	—
Porro's operation	3	2	—	—	—	5	1 in 5158	—	—
Pubiotomy	—	—	—	—	—	—	1 in	—	—
Prolapse of cord	56	74	6	11	10	157	1 in 164·26	—	—
Morbidity *b*	628	829	202	134	161	1954	1 in 13·19	—	—
Average morbidity	1 in 14·32	1 in 12·32	1 in 9·34	1 in 14·2	1 in 11·82	1 in 13·19	—	—	—
Maternal mortality	66	43	13	6	8	133	1 in 193·9	—	—
Average maternal mortality	1 in 136·31	1 in 253·09	1 in 145·15	1 in 317·3	1 in 238	1 in 193·9	—	—	—
Percentage maternal mortality	0·73	0·38	0·68	0·31	0·42	0·51	—	—	—

a. The proportion of each presentation is obtained by dividing the total number of each presentation into the total number of labours, less the total number of abortions.

b. Up to the year 1905–6 any case in which the temperature rose even once above 100·8° F. was considered "morbid." In that year the standard of morbidity was changed, and the following standard was adopted, in accordance with the recommendations of a Committee appointed by the British Medical Association:—the rising of the temperature to 100° F. on at least two occasions between the second and the eighth day.

c. This percentage is calculated in each instance on the total number of cases of the disease or condition from which the death resulted

TABLE B.—*Showing Cause of Death in the Rotunda Lying-in Hospital.*

1889-90. TOTAL 19.

Name.	Admitted.	Delivered.	Died.	Cause of death.	Notes.
C. R.	Nov. 30	Nov. 30	Dec. 1	Eclampsia	Chloral and chloroform treatment.
S. C.	Dec. 8	Dec. 8	Dec. 8	Accidental hæmorrhage	Child perforated and extracted.
M. C.	Dec. 19	Dec. 19	Dec. 19	Accidental hæmorrhage	Accouchement forcé.
T. H.	Dec. 28	Dec. 28	Dec. 28	Phthisis	Admitted moribund.
T. K.	Dec. 27	Jan. 5	Jan. 10	Septicæmia	Induction of premature labour by Barnes' bags.
J. S.	Jan. 14	Jan. 14	Jan. 15	Eclampsia	Chloral and chloroform treatment and delivery by craniotomy
S. H.	April 8	April 13	April 14	Purulent meningitis	Suffered from influenza previous to admission. Autopsy.
M. B.	April 28	April 30	May 1	Eclampsia	Chloral and chloroform treatment.
L. F.	May 6	May 7	May 23	Pyæmia	No operation performed.
A. F.	June 10	June 11	June 22	Septicæmia	No operation performed.
E. C.	June 20	June 22	June 25	Phthisis	Admitted in last stage.
A. B.	June 18	June 19	July 25	Septicæmia (?)	No operation performed.
E. M.	Aug. 2	Aug. 2	Aug. 27	Pyæmia	No operation performed.
M. B.	Aug. 15	Aug. 17	Aug. 29	Septicæmia	No operation performed.
S. P.	Aug. 16	Aug. 23	Sept. 5	Septicæmia	P.M.—Large sloughing myoma uteri.
M. L.	Aug. 18	Aug. 20	Sept. 25	Pyæmia	No operation performed.
M. F.	Oct. 6	Oct. 7	Oct. 12	Septicæmia	Delivery by forceps.
B. M.	Oct. 15	Oct. 15	Dec. 22	Pyæmia	No operation performed.
C. O'N.	Oct. 24	Oct. 29	Oct. 29	Intestinal obstruction	Suffered from intestinal obstruction for some days previous to admission.

1890-91. TOTAL 9.

M. McG.	Jan.	4	Jan.	4	Jan.	9	Phthisis	Admitted in last stage.
M. R.	Jan.	10	Jan.	10	Jan.	13	Pneumonia	Admitted with croupous pneumonia.
J. L.	Feb.	1	Feb.	1	Feb.	1	Accidental hæmorrhage	Accouchement forcé.
C. M.	Mar.	2	Mar.	2	Mar.	2	Accidental hæmorrhage	Accouchment forcé.
E. C.	May	5	May	5	May	6	Epilepsy	History of epilepsy for years.
M. F.	Aug.	4	Aug.	5	Aug.	6	Hyperemesis	Vomiting for a month previous to admission.
B. B.	Aug.	5	Aug.	6	Aug.	9	Pneumonia	Admitted with symptoms of pneumonia.
M. B.	Aug.	6	Aug.	6	Aug.	6	Hæmorrhage	Marginal placenta prævia; rupture of uterus; forceps delivery; died on couch.
C. K.	Oct.	2	Oct.	3	Oct.	3	Rupture of uterus	Long-standing case of prolapse of cervix; uterus ruptured six hours after labour commenced.

1891-2. TOTAL 9.

A. P.	Nov.	3	Nov.	4	Nov.	4	Eclampsia	Chloral and chloroform treatment.
M. S.	Nov.	18	Nov.	20	Nov.	29	Mania	Unmarried. Temperature remained normal until 30 minutes before death, then rose to 109·4° F.
B. C.	April	8	April	9	April	9	Mitral disease	Admitted in last stage.
M. M.	April	14	April	14	April	15	Empyema	
C. A.	June	14	June	14	June	15	Eclampsia	Chloral and chloroform treatment.
A. C.	June	23	June	24	June	26	Double pneumonia	Admitted with croupous pneumonia.
M. R.	June	29	June	30	June	30	Hæmorrhage	Admitted with rupture of cervix and vagina; Porro's operation performed, but it failed to check hæmorrhage.
M. B.	July	6	July	6	July	7	Pneumonia	Admitted with broncho-pneumonia.
M. B.	Oct.	27	Oct.	27	Oct.	28	Eclampsia	Chloral and chloroform treatment.

1892–3. Total 17.

Name.	Admitted.	Delivered.	Died.	Cause of death.	Notes.
M.	Dec. 17	Dec. 18	Dec. 18	Eclampsia	Chloral and chloroform treatment.
M. M'C.	Dec. 17	Dec. 18	Dec. 18	Hæmorrhage	Admitted with ruptured cervix owing to unskilled use of forceps.
M. N.	Jan. 1	Jan. 27	Jan. 27	Eclampsia	Chloral and chloroform treatment.
M. A. H.	Mar. 9	Mar. 10	Mar. 10	Phthisis	Admitted in last stage.
M. M. D.	April 7	April 7	April 8	Septicæmia	Admitted in advanced stage of sepsis.
M. F.	April 2	April 3	April 21	Pulmonary embolism	Occurred 18 days after delivery, subsequent to phlebo-thrombosis in leg.
M. H.	May 31	May 31	June 1	Post-partum hæmorrhage	Myomatous uterus.
M. P.	June 19	June 19	June 19	Mitral stenosis	Admitted in last stage.
M. M. C.	June 24	June 28	July 1	Cerebro-spinal meningitis	Ill before admission.
L. C.	June 25	June 25	July 14	Pyæmia	Ruptured symphysis during labour, and an abscess formed between the bones. Uterus normal.
C. B.	July 18	July 18	July 18	Accidental hæmorrhage	Vagina plugged until labour set in, then accouchement forcé.
M. O'C.	July 24	July 24	July 29	Sepsis	Admitted with ruptured cervix due to improper use of forceps; also septic.
M. A. R.	Aug. 31	Undelivered	Sept. 9	Uræmia	
K. L.	Sept. 24	Sept. 24	Sept. 26	Peritonitis	Admitted septic.
S. W.	Sept. 25	Sept. 25	Oct. 20	Mania	
K. D.	Sept. 30	Sept. 30	Sept. 30	Accidental hæmorrhage	Admitted with the vagina plugged, though membranes were ruptured; perforation followed by extraction; died on couch.
L. M'G.	Oct. 29	Oct. 29	Nov. 9	Sapræmia	Child delivered by symphysiotomy; wound sloughed.

1893–4. Total 7.

M. D.	Nov. 13	Nov. 15	Nov. 20	Uræmia	
K. C.	Dec. 20	Dec. 29	Jan. 5	Septicæmia	Child putrid; physometra.
E. D.	Feb. 19	Feb. 19	Feb. 24	Eclampsia (?)	Morphia treatment.
M. K.	Aug. 18	Aug. 18	Aug. 19	Syncope	Patient delivered by forceps; no hæmorrhage; died suddenly. P.M.—All organs healthy; no laceration of uterus or vagina.
K. K.	Aug. 15	Aug. 16	Aug. 19	Hyperemesis	Died of exhaustion.
E. H.	Oct. 1	Unde-livered	Oct. 6	Septicæmia	Plugged before admission for accidental hæmorrhage.
J. S.	Oct. 28	Oct. 28	Oct. 30	Cæsarean section	Died of ruptured intestine, which was injured during operation.

1894–5. Total 6.

A. C.	Dec. 13	Dec. 11	Dec. 25	Pyæmia	Admitted with incomplete abortion, and septic.
M. H.	Dec. 23	Dec. 23	Dec. 27	Eclampsia	Morphia treatment.
E. L.	Feb. 9	Unde-livered	Feb. 9	Nephritis	
C. H.	June 25	July 1	July 2	Bright's disease	Hyperemesis for six weeks before admission.
E. D.	Aug. 31	Unde-livered	Sept. 9	Heart disease	Died undelivered and not in labour.
M. B.	Oct. 11	Unde-livered	Oct. 13	Bright's disease	Died undelivered and not in labour.

1895–6. Total 1.

M. D.	Feb. 7	Feb. 16	Feb. 25	Septicæmia	Labour induced by bougies.

1896–7. Total 2.

Name.	Admitted.	Delivered.	Died.	Cause of death.	Notes.
A. M'D.	Dec. 23	Dec. 28	Dec. 31	Rupture of uterus and bladder	6-para, 4 children born dead, 5th alive. Contracted pelvis, head allowed to mould, transverse rupture of bladder and a second rupture by attrition involving bladder and lower uterine segment.
L. D.	Feb. 8	Feb. 8	Feb. 21	Septic endometritis	Admitted with ulcers on legs, and extensive sloughing ulceration of labia majora; no vaginal examinations were made.

1897-8. Total 6.

E. O'D.	Dec. 20	Dec. 21	Dec. 23	Cardiac disease	Admitted in last stage.
E. K.	Mar. 7	Mar. 7	Mar. 8	Chronic nephritis	Admitted in last stage.
A. M.	Mar. 26	Mar. 27	Mar. 28	Hyperemesis	Admitted in last stage.
K. B.	June 3	June 4	June 18	Puerperal mania	Died suddenly on fifth day of mania with brain symptoms. No P.M.
J. D.	June 11	June 11	June 11	Acute suppurative meningitis	Admitted in a comatose condition, delivered by post-mortem Cæsarean section; child asphyxiated, could not be revived.
M. C.	Oct. 4	Oct. 5	Oct. 23	Pyæmia	Cæsarean section, contracted pelvis.

1898–9. Total 10.

L. R.	Dec. 16	Dec. 16	Dec. 16	Pulmonary embolus (?)	Patient died suddenly during the second stage, labour apparently progressing normally.
M. O'C.	Feb. 17	Feb. 17	Mar. 8	Sepsis	No vaginal examination.
E. G.	Mar. 9	Mar. 9	Mar. 9	Accidental hæmorrhage	Patient admitted with membranes ruptured; hæmorrhage continued, and forceps were applied; some p.p.h.; death in thirty minutes.
M. C.	April 20	April 21	April 24	Sepsis	Porro's operation for contracted pelvis, Bright's disease.
M. R.	April 22	Undelivered	April 22	Eclampsia	Morphia treatment; thirteen fits.
L. B.	Aug. 15	Aug. 15	Aug. 18	Sepsis	Labour apparently normal; rupture of uterus discovered at the post-mortem examination.
R. C.	Aug. 20	Aug. 20	Aug. 23	Sepsis	Placenta prævia; admitted septic.
A. T.	Oct. 10	Oct. 10	Oct. 17	Sepsis	Placenta prævia; admitted septic.
L. M.	Oct. 12	Oct. 12	Oct. 12	Physometra; pulmonary embolus	Admitted in a condition of collapse; fœtus putrid.
X.	—	—	—	—	Particulars of case missing.

1899–1900. Total 6.

M. D.	Feb. 11	Feb. 11	Feb. 12	Hyperemesis and Bright's disease	Labour at full term.
R. M'D.	April 10	April 10	April 24	Acute miliary tuberculosis	
M. F.	June 2	June 2	June 8	Pulmonary embolism (?)	Severe asthma and bronchitis. No P.M.
E. B.	July 2	July 2	July 2	Advanced renal disease	Admitted moribund.
E. C.	July 15	July 15	July 15	Physometra and embolism	Admitted collapsed. Putrid hydrocephalic fœtus.
M. B.	Sept. 30	Sept. 30	Oct. 2	Hæmorrhage and shock	Apparently slight degree of contracted pelvis; child delivered by version; rupture of uterus found after delivery; pan-hysterectomy on account of hæmorrhage.

1900-01. TOTAL 3.

Name.	Admitted.	Delivered.	Died.	Cause of death.	Notes.
E. C.	Dec. 18	Dec. 19	Dec. 29	Septic peritonitis	Fibroid tumour obstructing delivery; sent into hospital in labour; the membranes ruptured; Cæsarean section performed.
B. F.	April 17	April 17	April 25	Phthisis	Admitted in very advanced state.
M. B.	Sept. 5	Sept. 10	Sept. 22	Septicæmia	Induction of labour for contracted pelvis; considerable difficulty in starting labour.

1901-02. TOTAL 6.

E. H.	Jan. 17	Undelivered	Jan. 17	Concealed accidental hæmorrhage	Plugging and binder; admitted moribund.
J. M'C.	Mar. 20	Mar. 22	Mar. 33	Hydatidiform mole	Cause of death obscure.
M. J. M.	April 7	Undelivered	April 7	Eclampsia	Morphia treatment; six months pregnant; not in labour.
B. M'L.	April 14	Undelivered	April 14	Eclampsia	Morphia treatment; not in labour.
J. D.	April 28	April 28	May 13	Puerperal sepsis	Forceps delivery. Typical signs of tubercular peritonitis; no P.M.
A. C.	July 15	July 15	July 22	Pneumonia	

1902-3. TOTAL 9.

C. G.	Dec. 27	Dec. 28	Dec. 28	Ruptured uterus	Rupture occurred 24 hours before admission.
L. S.	Jan. 18	Jan. 18	Feb. 22	Phthisis	Labour normal.
M. C.	Jan. 20	Jan. 20	Jan. 23	Ruptured uterus	Rupture occurred at commencement of second stage; delivery by forceps.
M. G.	Jan. 23	Jan. 23	Feb. 2	Septicæmia	Membranes ruptured 7 days before delivery; putrid fœtus.
A. F.	Feb. 4	—	Feb. 4	Eclampsia	Admitted comatose; died undelivered.
B. W.	Feb. 5	Feb. 5	Feb. 8	Septicæmia	Placenta removed manually.
E. M.	Feb. 16	Feb. 17	Feb. 17	Post-partum hæmorrhage	Occurred after expulsion of placenta; labour otherwise normal.
E. E.	May 4	—	May 4	Eclampsia	Had 12 fits before admission; died undelivered.
M. O.	May 30	—	May 31	Uræmia	Admitted comatose; died three hours after, undelivered.

1903-4. TOTAL 13.

K. M.	Dec. 30	Dec. 30	Dec. 30	Accidental hæmorrhage	Hæmorrhage checked by plugging, but patient died, apparently from shock.
A. I.	Jan. 21	Jan. 22	Jan. 27	Rupture of uterus	Version and extraction followed by hysterectomy on account of laceration.
M. E.	Feb. 17	Feb. 18	Mar. 8	Phthisis	
L. M.	Mar. 6	Mar. 7	April 1	Septicæmia	
M. D.	April 13	April 13	April 18	Pneumonia	
E. P.	April 13	April 13	April 15	Cardiac failure	Delivery by forceps.
E. McE.	April 16	April 16	June 9	Pyæmia	
A. S.	April 23	April 24	May 5	Septicæmia	Vagina plugged prior to admission on account of placenta prævia.
M. W.	April 27	April 27	May 12	Septicæmia	Secondary p.p.h.
A. M.	Mar. 16	Mar. 17	May 23	Pyæmia	
M. McD.	May 15	May 15	May 30	Septicæmia	
S. B.	June 23	June 23	July 27	Pyæmia	
E. G.	Oct. 12	Oct. 12	Oct. 20	Septicæmia	Putrid fœtus, 7th month.

1904-5. TOTAL 6.

Name.	Admitted.	Delivered.	Died.	Cause of death.	Notes.
M. C.	Nov. 11	Nov. 11	Nov. 14	Eclampsia	Fits commenced after delivery. P.M. showed extensive degeneration of liver.
M. K.	May 24	May 25	May 25	Collapse	Rupture of uterus occurred prior to admission from obstructed delivery; child delivered by forceps; rent in cervix plugged; death in a few hours.
M. K.	May 25	May 26	May 26	Eclampsia	Death occurred 5½ hours after delivery and 11 hours after the last fit.
S. O'K.	June 30	June 30	July 8	Septicæmia	Labia and thighs covered with syphilitic ulcers at time of admission.
A. D.	Sept. 18	Sept. 18	Sept. 26	Pneumonia	
M. C.	Oct. 19	Oct. 20	Oct. 27	Septicæmia	Admitted with membranes ruptured and the leg of a macerated fœtus protruding through vulva.

1905-6. TOTAL 8.

A. H.	Mar. 3	Mar. 3	Mar. 4	Syncope	Normal labour; died five or six hours after delivery; very slight hæmorrhage.
E. C.	Mar. 16	Mar. 16	Mar. 16	Placenta prævia	Admitted in collapsed condition.
E. N.	May 19	May 20	June 25	Pyæmia	
M. O'N.	June 24	June 25	July 13	Enteric	Admitted with the disease.
M. K.	July 20	July 22	July 22	Syncope	Normal labour; slight amount of hæmorrhage.
M. M.	Aug. 8	Aug. 8	Aug. 8	Concealed accidental hæmorrhage	Vaginal tampon tried without success.
M. G.	Oct. 14	—	Oct. 14	Eclampsia	Twenty-six fits; patient died undelivered.
E. H.	Oct. 27	Oct. 27	Oct. 27	Syncope	Normal labour save for protracted 3rd stage; slight amount of hæmorrhage.

Table C.

In the following table an attempt has been made to classify the causes of the deaths recorded in Table B. These causes have been divided into three groups:—Group I, purely obstetrical causes; Group II, pre-existing disease of the mother; Group III, accidental causes, by which is meant causes which might have been avoided. As will be seen, the principal component of this group is some form of septic infection.

Group I.—Purely obstetrical causes.		Group II.—Pre-existing disease.		Group III.—Accidental causes.	
Cause of death.	No. of cases.	Cause of death.	No. of cases.	Cause of death.	No. of cases.
Accidental hæmorrhage	10	Eclampsia	17	Septicæmia	20
Rupture of uterus	11	Phthisis	7	Pyæmia	10
Mania	3	Meningitis	3	Sapræmia	1
Pulmonary embolus	5	Epilepsy	1	Septic endometritis	1
Post-partum hæmorrhage	2	Pneumonia	7	Septic peritonitis	1
Cæsarean section	3	Hyperemesis	4	Septic infection (form not specified)	7
Placenta prævia	1	Cardiac disease	4	Intestinal obstruction	1
Vesicular mole	1	Empyema	1		
		Uræmia	2		
		Cardiac syncope	5		
		Nephritis	5		
		Miliary tuberculosis	1		
		Enteric	1		
Total	36	Total	58	Total	41

Cause of death not stated, 1 case. Total of deaths, 136.

TABLE D.—*Infant Mortality.*

	1896-97.	1897-98.	1898-99.	1899-1900.	1900-01.	1901-02.	1902-03.	1903-04.	1904-05.	1905-06.	Total.	Average.
Number of births .	1397	1501	1560	1511	1554	1629	1630	1827	1865	1838	16,312	—
Premature deaths, recent . . .	31	39	29	33	8	17	11	20	18	20	231	1 in 70·61
Full-term deaths, recent . . .	21	42	26	32	32	25	34	32	39	30	313	1 in 52·11
Macerated . .	19	29	30	36	40	21	32	48	52	41	348	1 in 46·87
Putrid . . .	2	2	1	2	5	—	1	1	—	—	14	1 in 1165·14
Total number born dead . . .	73	112	86	103	85	63	78	101	109	91	901	1 in 18·1
Infants born alive who died in hospital	39	35	30	38	34	39	33	40	34	30	352	1 in 46·34
Total number born dead or died in hospital . . .	112	147	116	141	119	102	111	141	143	121	1,253	1 in 13·01

APPENDIX II.

A NEW TABLE FOR DETERMINING THE APPROXIMATE DATE OF DELIVERY FROM THE HEIGHT OF THE UTERUS.

The Height of the Uterus.

A Two fingers above symphysis	B Half way between symphysis and umbilicus	C At umbilicus	D Three fingers above umbilicus	E Half way between umbilicus & ensiform cartilage	F At ensiform cartilage	G Approximate date of delivery.
Jan. 1	Jan. 29	Feb. 26	Mar. 26	Apr. 23	May 21	June 18
„ 15	Feb. 12	Mar. 12	April 9	May 7	June 4	July 2
Feb. 1	Mar. 1	„ 29	„ 26	„ 24	„ 21	„ 19
„ 15	„ 15	April 12	May 10	June 7	July 5	Aug. 2
Mar. 1	„ 29	„ 26	„ 24	„ 21	„ 19	„ 16
„ 15	April 12	May 10	June 7	July 5	Aug. 2	„ 30
April 1	„ 29	„ 27	„ 24	„ 22	„ 19	Sept. 16
„ 15	May 13	June 10	July 8	Aug. 5	Sept. 2	„ 30
May 1	„ 29	„ 26	„ 24	„ 21	„ 18	Oct. 16
„ 15	June 12	July 10	Aug. 7	Sept. 4	Oct. 2	„ 30
June 1	„ 29	„ 27	„ 24	„ 21	„ 19	Nov. 16
„ 15	July 13	Aug. 10	Sept. 7	Oct. 5	Nov. 2	„ 30
July 1	„ 29	„ 26	„ 23	„ 21	„ 18	Dec. 16
„ 15	Aug. 12	Sept. 9	Oct. 7	Nov. 4	Dec 2	„ 30
Aug. 1	„ 29	„ 26	„ 24	„ 21	„ 19	Jan. 16
„ 15	Sept. 12	Oct. 10	Nov. 7	Dec. 5	Jan. 2	„ 30
Sept. 1	„ 29	„ 27	„ 24	„ 22	„ 19	Feb. 16
„ 15	Oct. 13	Nov. 10	Dec. 8	Jan. 5	Feb. 2	Mar. 2
Oct. 1	„ 29	„ 26	„ 24	„ 21	„ 18	„ 18
„ 15	Nov. 12	Dec. 10	Jan. 7	Feb. 4	Mar. 4	April 1
Nov. 1	„ 29	„ 27	„ 24	„ 21	„ 21	„ 18
„ 15	Dec. 13	Jan. 10	Feb. 7	Mar. 7	April 4	May 2
Dec 1	„ 29	„ 26	„ 23	„ 23	„ 20	„ 18
„ 15	Jan 12	Feb. 9	Mar. 9	April 6	May 4	June 1

Rules for the Use of the Table.

1. Note the height of the uterus in the patient's abdomen and the day of the month. Look down the column belonging to that particular height until you reach the corresponding date. Then read horizontally across the Table, and the date of delivery will be found in the last column. Thus:—The uterus reaches to the umbilicus on June 10th. Read down Column C until you come to June 10th, and then reading horizontally across the Table you find in the last column September 30th as the approximate day of delivery.

2. If the day of the month does not correspond with any date in the proper column, proceed as follows:—Ascertain the day of delivery counting from the nearest earlier date in the proper column; add to this date the difference between the day of the month and the date from which we have counted. The result will be the day of delivery. Thus:—The uterus is half way between the umbilicus and the ensiform cartilage on July 17th. The proper column is E, and the nearest earlier date in it is July 5th, making the day of delivery August 30th. The difference between July 17th and July 5th is twelve days, and this added to August 30th gives September 11th as the approximate day of delivery.

3. If the height of the uterus does not correspond with any of the headings in the Table, proceed as follows:—Ascertain the day of delivery by Rule 1, using the column whose heading corresponds with the fixed level next below the actual height of the uterus. Then measure in finger-breadths the height of the uterus above this level, and also the distance between this level and the fixed level immediately above it. Find what fraction the first distance is of the second, take this fraction of twenty-eight days and add it to the date already ascertained, and the result will be the day of delivery. Thus:—The actual height of the uterus on September 9th is two finger-breadths above the umbilicus. The fixed level immediately below this is "at the umbilicus." Therefore, ascertain the date of delivery from September 9th in Column C. This date is December 30th. The next fixed level is "three fingers above the umbilicus." Therefore the actual height of the uterus is two-thirds the distance between the two fixed levels. Take two-thirds of twenty-eight days, *i. e.* approximately eighteen days, and add this to December 30th. The result—January 17th—will be the approximate day of delivery.

INDEX.

Abdomen, examination of, in pregnancy, 103—106
Abdominal palpation, 49—61
— pregnancy, secondary, 362—364
Abnormal mechanism in breech presentation, 241
— — in face presentation, 217
— — in vertex presentation, 168—174
Abortion, 334—345
— diagnosis of, from extra-uterine pregnancy, 358—360
— induction of, 533, 534
— — in hyperemesis, 281
— — in incarceration of uterus, 313
Abscess of breast, 516—519
Acardiac monster, 454
Accidental hæmorrhage, 372—380
— — concealed, 373—375
— — external, 375—380
— — fœtal mortality in, 387, 388
Accouchement forcé, 374
— — in accidental hæmorrhage, 374, 379
— — in eclampsia, 331, 332
Accouchement forcé in placenta prævia, 386
Acetone in urine in eclampsia, 320
Acute sepsis, 497—511
Adherent placenta, 392—395
After-coming head, extraction of, 248—252
— perforation of, 589
Amnion, 21, 22
Amniotic adhesions, 306
Anæmia of pregnancy, 288, 289
Anæsthesia, 207—209
Anencephalic monster, 454
Anteflexion of pregnant uterus, 309, 310
Ante-partum hæmorrhage, 362—388
— vaginal douching, 6, 7
Anterior development of retro-verted uterus, 311
Anterior fontanelle presentation, 229—231
— parietal presentation, 169—172
Anteversion of pregnant uterus, 310
Anti-streptococcic serum, 507, 508

Anus, to distinguish, from mouth, 239
Armamentarium, obstetric, 179—185
Arms over head in breech cases, 246, 247
Arrested breech, 564, 566
Articulations of pelvis, 9, 10
— — changes in, 94
Artificial abortion, 433, 434
— feeding of infants, 597—608
— removal of placenta, 394, 395
— respiration, 610—613
Asepsis in midwifery, 1—8
Aspect of patient during puerperium, 271
Asphyxia neonatorum, 609—613
Aspiration of bladder in retroversion during pregnancy, 287
— of uterus, 314
Asynclitism of head, anterior, 172—174
— posterior, 169—172
Atonic post-partum hæmorrhage, 464—470
Atresia of cervix, 442—444
— of vagina, 444
Attitude of fœtus, 39
Auscultation of fœtal heart, 68—70
Auscultatory signs of pregnancy, 104—106
Axis-traction forceps, 541, 542

Ballottement, internal, 106, 107
Barnes' bag, 530, 531
— method in placenta prævia, 386, 387
Barnes' use of iron in post-partum hæmorrhage, 468, 469
Battledore placenta, 307, 308
Baudelocque's method in face presentation, 220, 221
Bimanual method of expressing detached ovum, 339, 340
Bladder, care of, in puerperium, 273, 274
Blue asphyxia, 609
Bossi's dilator, 528
Bouchard's theory of eclampsia, 321, 322
Bozemann's return catheter, Gibson's modification, 181
Bowels, care of, after labour, 274
— — before labour, 188
Braun's blunt hook, 590
Braxton Hicks' method of performing version, 556
Breasts, care of, in pregnancy, 114, 115
— changes of, in pregnancy, 94—96
— inflammation of, 516—519
— secretion of, 601
Breech presentation, 234—252
Bregma, 30
Bright's disease as cause of decidual endometritis, 295
— — in pregnancy, 281—283
Brow presentation, 42, 223—229
— — forceps in, 228
Budin, early and late ligation of cord, 197
— maximum diameter of, 33
— method of feeding infants, 605, 606

Cæsarean section, conservative, 568—571
— — radical, 571, 572
Caput succedaneum, 146
Carbolised vaseline, danger of, 4, 5
Carcinoma of cervix, 437—439
Catheter, use of, during puerperium, 273, 274
Catheterisation of uterus for inducing labour, 536, 537
Cephalhæmatoma, 613
Cephalic version, 555, 556
Cephalotribe in impacted breech, 566
Certain signs of pregnancy, 109
Cervical abortion, 341
Cervix, artificial dilatation of, 526—533
— dilatation of, in labour, 128—131
— lacerations of, 485
— shape of, in abortion, 344, 345
— softening of, in pregnancy, 85
Champetier de Ribes' dilator, 530
— in eclampsia, 332
— — in placenta prævia, 385, 386
Child, diseases of, 609—624
— bowels of, 596
— changes in, after birth, 594—597
— feeding of, 597—608
— pulse of, 595, 596
— respiration of, 595
— stomach of, capacity of, 603
— temperature, 595
— umbilical cord of, 594, 595
— urine of, 596
— weight of, 596, 597
Chloasma uterina, 100
Chloral hydrate in eclampsia, 328, 329
Chloroform in eclampsia, 328, 329
Chorion, 20, 21
Chorion epithelioma, 303
Chronic nephritis, 281—283
Circulation, fœtal, 36—39
— maternal, in pregnancy, 97, 98
Cleidotomy, 591—593
— in impacted shoulders, 451
Collapse due to hæmorrhage, 471—476
Colostrum, 270
Coma in eclampsia, 324, 325
Complete abortion, 342
Conjugata externa, 15
— obliqua, 23
— vera, 11
— — measurement of, 77—79
Constipation in pregnancy, 383, 384
Contracted pelvis, 396—435
— — induced abortion in, 534
— — use of forceps in, 429, 430
Contraction ring, *vide* Retraction ring
Contractions of uterus, 123—127
Convulsions, eclamptic, 318—334
— infantile, 613—616
Copeman's treatment for hyperemesis 280, 281
Cord, umbilical, 22, 23
— — about neck of child, 194, 195
— — ligation of, after labour 197, 198
— — prolapse of, 456—461
Corpore conduplicato, 259
Corpus luteum, 92, 93

Corrosive sublimate for douching, 8
— — for hands, 4
Cow's milk, constituents of, 601
Coxalgic pelvis, 409, 410
Cracked nipples, 517
Cranioclast and cephalotribe (Winter), 585
Craniotomy, 582—589
"Credé's method" for placental delivery (foot-note), 199
Creolin for douching, 8
Cross-birth, 253—262
Crural phlebo-thrombosis, 519—522
Curetting in abortion, 340
— in hydatidiform mole, 303
— in sapræmia, 496
— in septic endometritis, 503, 504

Decapitation, 589, 590
Decidua, the, 86—91
— diseases of, 292—306
Decidual endometritis, acute, 292, 293
— chronic, 293—297
Deciduoma malignum, 303
Delayed labour, 348, 349
Delivery, methods of estimating date of, 110—112
Depressed nipples, 114
Diameters of fœtal head, 32—34
— of pelvis, 10—15
Diarrhœa of infants, 616, 617
Diet of puerperium, 273
Digestive system, maternal, in pregnancy, 99
Dilatation of cervix to induce labour, 538
Dilatation of cervix by incision, 526—528
— — hydrostatic, 530
— — instrumental, 528, 529
Discoloration of vagina in pregnancy, 92
Diseases of pregnancy, 277—291
Döderlein's needle, 577
— method of performing pubiotomy, 577—580
Double monster, 454, 455
Doubtful signs of pregnancy, 109
Douche, syphon, 180, 181
— vaginal, 6—8
Dublin method of expressing placenta, 200, 204
Ducts of Müller, 315
Dystocia in twin pregnancies, 266, 267

Eclampsia, 318—334
Ectopic gestation, 350—365
Embryo, measurements of, 24—28
Embryotomy, 589—593
Ergot, 206, 207
— in decidual endometritis, 296, 297
— in post-partum hæmorrhage, 467
Euphoria in acute sepsis, 506
Evisceration, 590, 591
Examination, obstetrical, 46—79
Expression of the head, in breech presentation, 249, 250
— — in vertex presentation, 191—194
— of detached ovum, 339, 340
— of placenta, 200, 204
External conjugate, 15

External version, cephalic, 555, 556
— — podalic, 557
Extra-uterine pregnancy, 350—365

Face in pregnancy, 103
— presentations, 42,
— — craniotomy in, 589
Fallopian tubes in pregnancy, 92
Farinaceous food for infants, objections to, 608
Feeding bottle, essentials of, 600
Fillet, use of, in impacted breech, 565, 566
— — to complete internal version, 560—562
First stage, treatment of, 185—189
Fissured pelvis, 420
Fixity of presenting part as means of diagnosing labour, 57, 58
— — factors that prevent, 58
Flat pelvis, 400—408
Fœtal head, anatomy of, 28—35
— axis pressure, 144
— circulation, 36—39
— heart-sounds, 104, 105
— — as indications for forceps, 543
— — method of diagnosing positions by, 68, 69
— — value as a sign of pregnancy, 109
Fœtus, anatomy of, 24—39
— attitude of, 39
— breech of, 35, 36
— diagnosis of death of, 112
— excessive size of, 449—451
— length of, 36
Fœtus, palpation of, in labour, 49—61
— — value as sign of pregnancy, 109
— papyraceus, 297
— position of, 43—45
— presentation of, 39—43
— several, in uterus, 263
— trunk of, 35
Fontanelles of fœtal head, 30—32
Foot presentation, diagnosis of, 64, 65, 239
Forceps, the, 540—553
— in breech presentation, 553
— in brow presentation, 228, 553
— in contracted pelvis, 430
— in eclampsia, 332
— in face presentations, 222, 553
— in hæmatoma of vulva, 479
— in impacted breech, 566
— in occipito-posterior positions, 552
— in prolapse of cord, 461
— to after-coming head, 251, 252
Form restitution force, 143, 144
Frerichs' theory of eclampsia, 320
Frommer's cervical dilator, 528, 529
Fundal grip, 50, 51
Funic souffle, 105
Funis, *vide* Umbilical cord
Funnel-shaped pelvis, 414

Gauze fillet in impacted breech 565, 566
— — in internal version, 560—562
General contents pressure, 142
Generally contracted pelvis, 398—400

Generally contracted and flat pelvis, 406, 407
Genitals, anasarca of, 289
— disinfection of, 5—8
— lacerations of, 481—489
Gigli's wire saw, 578
Glycerine, intra-uterine injection of, 537, 538
Gonorrhœal ophthalmia, 620, 621
Green diarrhœa of infants, 616, 617
Gum, red, 622, 623

Hæmatocele, retro-uterine, 352, 358—361
Hæmatoma of broad ligament, 352
— of vulva, 477—479
Hæmorrhage, accidental, 372—380
— during fourth, fifth, and sixth months, 367—372
— in abortion, 338—340
— in extra-uterine pregnancy, 357—361
— in placenta prævia, 380—388
— post-partum, 462—476
— secondary, from funis, 618, 619
Hæmorrhoids in pregnancy, 290
Heart, fœtal, auscultation of, 68, 69, 104, 105
— — as indication for forceps, 543
Hegar's sign of pregnancy, 107, 108
Hermetic bandage of eyes, 621
History of patient, 46, 47
Humanised milk, 600—607
Hydatidiform or vesicular mole, 299—303
Hydræmia of pregnancy, 289
Hydramnios, 303—306
Hydrastis Canadensis in abortion, 338
Hydrencephalocele, 452
Hydrocephalus, 452
Hydromeningocele, 452
Hydrorrhœa gravidarum, 294—299
Hygroma, cystic, 452
Hyperemesis gravidarum, 278—281
Hypertrophy of cervix in pregnancy, 314
Hysterectomy, 571, 572

Icterus neonatorum, 617, 618
Impacted breech, 564 - 566
— shoulders, 450, 451
Incarceration of pregnant uterus, 311—314
Inclined planes of pelvis, 14
Incomplete abortion, 341, 342
Incontinence of urine in pregnancy, 287, 288
Induction of abortion, 533, 534
— — in hydatidiform mole, 302, 303
— — in hyperemesis, 281
— — in incarcerated uterus, 313, 314
— premature labour, 534—539
— — in contracted pelvis, 431, 433—435
— — in eclampsia, 331, 332
— — in hydramnios, 306
— — time at which to induce, 433—435
Inertia uteri, 390—392
Infant feeding, 597—608

Infusion, intra-venous, in hæmorrhage, 473—475
Injections, intra-uterine, for inducing labour, 537, 538
— prophylactic, 6—8
— vaginal, in labour, 7, 8
Insanity, puerperal, 522—525
Insertio velamentosa, 308
Inspection of patient, 47—49
Internal version, 559—563
Interstitial mastitis, 514—516
Inversio uteri, 479—481
Involution of uterus, 268, 269
Iron, injection of, in post-partum hæmorrhage, 468, 469
Ischuria paradoxa, 285

Jacquemin's sign of pregnancy, 106
Jaundice in the new-born, 617, 618
Jelly of Wharton, 22, 23
Justo-minor pelvis, 398—400

Knee presentation, diagnosis of, 65, 239
Kossmann's method of inducing labour, 538
Krauze's method of inducing labour, 536, 537

Labour, causes of, 117—119
— definition of, 116, 117
— diagnosis of, 150—152
— duration of stages, 119, 120
— induction of, 534—539
— management of, 176—209
— mechanism of normal, 157—168
— pains, nature of, 124—127
Labour, phenomena of, 120—147
— preparation for, 176—179
— stages of, 119, 120
Lactation, 270, 271
Langhans' layer, 19
Laparotomy in extra-uterine pregnancy, 360, 363
— in rupture of the uterus, 484, 485
Levator ani muscle, 165
Ligaments, uterine, in pregnancy, 94
Ligation of cord, early *v.* late, 197, 198
Liquor amnii, 23, 24
— — excess of, 303—306
— — insufficiency of, 306
Lithopædion, 364
Lochia, 269, 270
Locked twins, 266, 267
Longings during pregnancy, 100
Lower uterine segment, softening of, in pregnancy, 107, 108
— — anatomy of, 124
— — changes in, during labour, 132—136
Lubricants, 4, 5
Lymphatic sepsis, 505—509

Malformations of pregnant uterus, 315—317
Malpositions of pregnant uterus, 309—315
Mania, puerperal, 523—525
Martin's method for delivering after-coming head, 249, 250
Massage of uterus in weak pains, 391
Mastitis, 516—519

Mastitis, infantile, 619
Maternal heart-sounds in diagnosis of pregnancy, 105
Matthews Duncan's mechanism of placental delivery, 147
— — rule for estimating date of confinement, 111
Measurements of fœtal skull, 32—34
— of pelvis, 10—15
Mechanism of labour in brow presentation, 226, 227
— — in anterior fontanelle presentation, 230, 231
— — — parietal presentation, 169—172
— — in face presentation, 215—217
— — — abnormal, 217
— — in pelvic presentation, 239—241
— — — abnormal, 241
— — in posterior fontanelle presentation, 232
— — — parietal presentation, 172—174
— — in transverse presentation, 257—259
— — in vertex presentation 157—168
— — — abnormal, 168—174
Melancholia, puerperal, 523—525
Membranes, constitution of, 20—22
— abnormal permeability of, 298, 299
Menses, cessation of, in pregnancy, 101, 102
Mento-posterior positions of face, 217, 222
Midwifery case, the author's, 183, 184
— steriliser and douche, 185 186
Miliaria rubra, 622, 623
Milk, cow's, 601
— human, 270, 271, 601
Milne Murray's forceps, 552
Miscarriage, 245, 247
Missed abortion, 242, 243
Monsters, 454, 455
Montgomery's follicles, 95, 96
Morning sickness, 102
Morphia in eclampsia, 329
Moulding of head in contracted pelvis, 429
— — in labour, 145, 146
Movements, fœtal, excessive, as sign of approaching death, 112
Müller's method of ascertaining time to induce labour in contracted pelvis, 435
Multiple pregnancy, 263—267
Murphy's inhaler, 209
Myoma of uterus, 437—439

Naegele, obliquity of, 169—172
— — reversed, 172, 174
— rule for ascertaining date of confinement, 111
— pelvis of, 410
Nausea in pregnancy, 102
Nephritis gravidarum, 281—283
Nervous system, maternal, in pregnancy, 99, 100
Neuralgia in pregnancy, 236
Neurotic theory of eclampsia, 322
Neville's axis-traction forceps, 542

Nipples, care of, 114, 115
Normal labour, definition of, 176
— management of, 176—209
— preparations for, 176—179
Nuchal position of arm, 447—449
Nuclein, 509
Nursing, contra-indications to, 597, 598

Objective symptoms of pregnancy, 103—108
Oblique diameters of pelvis, 11, 12
Obliquely distorted pelvis, 408—411
Obstetrical bag, contents of, 179—185
— case, the author's, 183, 184
— couch, 178
— requisites, 177, 178
Occipito-posterior positions, mechanism of, 168, 169
— — management of, 196
— — use of forceps in, 552
Oidium albicans, 623, 625
Oligo-hydramnios, 306
Operculum, nature of, 2, 3
Ophthalmia neonatorum, 620, 621
Opium in abortion, 338
— in uterine inertia, 392
Osteomalacic pelvis, 414—417
Ovarian pregnancy, 356
Ovaries in pregnancy, 92—94
— tumours of, in labour, 440, 441
Ovum, constitution of, 16—24

Painless contractions of uterus, 151, 152
Palpation, abdominal, 49—61
Parametritis in puerperium, 501, 502
Parenchymatous mastitis, 516, 517
Partridge's method in face presentation, 221
Partus immaturus, 117, 345—347
— maturus, 117
— prematurus, 117, 347
— serotinus, 118, 348, 349
Pasley's douche stand, 187
Pasteurising milk, 606, 607
Pawlic's grip, 53
Pelvic bones, movements of, 94, 140, 141
— deformity, 396—435
— — method of inducing labour in, 536, 537
— grips, 53—56
— presentation, 234—252
— — forceps in, 251, 252
Pelvimeter, Martin's, 72
— Skutsch's, 76, 77
Pelvimetry, 70—79
Pelvis, anatomy of, 9—15
— tumours of, in labour, 441, 442
Pelzer's method of inducing labour, 537, 538
Perforation, 584
Perineum, dilatation of, 136—140
— lacerations of, 485—489
— protection of, in labour, 190—194
Peritonitis, puerperal, 502
Phenomena of labour, 120—147
— of pregnancy, 81—100
— of puerperium, 268—271
Phlegmasia alba dolens, 520, 521

Pigmentation, maternal, in pregnancy, 100
Pica, 100
Placenta, abnormal situation of, 380
— anomalies of, 306—308
— anatomy of, 16—20
— artificial removal of, 394, 395
— battledore, 307, 308
— delivery of, in normal labour, 199—206
— functions of, 20
— mechanism of delivery, 147
— membranacea, 307
— method of ascertaining when in vagina, 201—204
— prævia, 380—388
— succenturiata, 307
Plugging uterus in post-partum hæmorrhage, 467, 468
— — in sapræmia, 496, 497
— vagina in abortion, 340
— — in accidental hæmorrhage, 377, 378
— — in placenta prævia, 386
— — to induce labour, 536
Podalic version, 556—563
Polypi of uterus during labour, 428, 429
Polyvalent streptococcic serum, 507, 508
Porro's operation, 572
Position of fœtus, 43—45
Posterior fontanelle presentation, 43, 231—233
— parietal presentation, 172—174, 196, 197
Post-hæmorrhagic collapse, 471—476
Post-partum hæmorrhage, 462
Post-partum hæmorrhage, atonic, 464—470
— — concealed, 470
— — primary, 462—470
— — secondary, 471,
— — traumatic, 463, 464
Post-partum prophylactic douching, 7, 8
Postural treatment in oblique presentation, 260, 261
— — in prolapse of the cord, 458, 459
Prague method of delivering after-coming head, 248, 249
Precipitate labour, 388
Pregnancy, definition of, 80
— diagnosis of, 101—112
— duration of, 80, 81
— extra-uterine, 350—365
— hygiene of, 113—115
— kidney, 281, 282
— multiple, 261—267
— phenomena of, 81—100
Premature labour, 347
— — induction of, 534—539
— — — in contracted pelvis, 433—435
Presentation of fœtus, 39—43
— anterior fontanelle, 42, 43, 229—231
— breech, 43, 234—252
— brow, 42, 223—229
— diagnosis of, 50—57
— face, 42, 210—223
— posterior fontanelle, 43, 231—233
— transverse, 43, 253—262
— vertex, 41, 42, 153—175
Probable signs of pregnancy, 109
Prolapse of cord, 456—461

Prolapse of limb during labour, 449
Prolapsus uteri during pregnancy, 314, 315
Prolonged labour, symptoms of, 149, 150
Prophylactic douching, 6—8
Pruritus vulvæ during pregnancy, 290, 291
Pseudo-cyesis, 110
Pseudo-osteomalacic pelvis, 418
Pubiotomy, 576—581
Puerperal insanity, 522—525
— state, 268—276
— ulcer, 494, 497
Pulmonary embolus, 512, 513
Pulse during puerperium, 271, 272
Purgatives before labour, 176, 177
— during puerperium, 274
— in eclampsia, 330
Pyæmia, 509—511
Pyrosis of pregnancy, 283

Quadruplets, 292
Quickening, 110
Quintuplets, 292

Rachitic flat pelvis, 402—406
Regions of fœtal head, 30—32
Relapsing kidney of pregnancy, 282
Reposition of prolapsed cord, 458—460
Respiration, maternal, in pregnancy, 98
Retained placenta, 392—395
Retention of urine, in infant, 621, 622
— in pregnancy, 285—287
Retraction ring, 132—134
Retraction ring as a contra-indication to version, 563
— — as a sign of impending rupture, 59, 60, 150
Retroflexion of gravid uterus, 310—314
Retro-uterine hæmatocele, 352, 358—361
Rheinstädter's flushing curette, 340
Roberts' pelvis, 412
Round ligament as sign of threatened rupture of uterus, 60, 150
Rubber gloves, use of, 5
Rupture of membranes in accidental hæmorrhage, 379
— — in placenta prævia, 385
— — to induce labour, 538, 539
— of uterus, 481—485
Ruptured tubal pregnancy, 357—361

Sacro-iliac joints, movements of, 94
Salivation during pregnancy, 290
Sapræmia, 490—497
Schatz's method in face presentations, 220, 221
Scheele's method of inducing labour, 538, 539
Schultze's mechanism of placental delivery, 147
— method of artificial respiration, 611—613
Scolio-rachitic pelvis, 409
Second stage, treatment of, 189—198
Secretion of breast, 270, 271, 601
Sepsis, lymphatic, 505—509

Sepsis, venous, 509—511
Septic infection, 497—511
— — artificial means of preventing, 2—7
— — general, 505—511
— — local, 500—504
— — natural mechanism for preventing, 2, 3
Serum, anti-streptococcic, 507, 508
Shoulders, impacted, 450, 451
— — cleidotomy in, 591—593
Show, the, 152
Signs of pregnancy, 101—110
Simple flat pelvis, 401—406
Skutsch's pelvimeter, 76, 77
Sleep, absence of, in sepsis, 271, 272
Smellie's method of delivering after-coming head, 250—252
Soap as lubricant, 5
Sounds in pregnancy, 104—106
Spiegelberg's sign of pregnancy, 106
— table of twin presentations, 265
Spina bifida, 452, 453
Spineli's method of inducing labour, 356
Spondylolisthetic pelvis, 418
Spontaneous evolution, 259
— version, 257, 258
Stages of labour, 119, 120
Stenosis of cervix, 442—444
— of vagina, 444
Sterilisation of genitals, 8
— of hands, 3—5
— of instruments, 5
— of milk, 605—607
Sterilisation of vagina, 6—8
Steriliser for instruments, 183, 184
— for milk, 606
Stomatitis mycosa, 623, 624
Stratum compactum, 90, 91
— spongiosum, 90
Striæ gravidarum, 97
Strophulus, 622, 623
Stumpf's theory of eclampsia, 321
Sub-involution of uterus, 513—515
Subjective symptoms of pregnancy, 101—103
Susurrus, muscular, 106
Sutures of fœtal skull, 29, 30
Symphysiotomy, 572—575
Syncytium, 19
Syphilis as cause of abortion, 336, 337
Syphon douche, 180, 181

Tamponing, external, 469
— of uterus, 467, 468
— of vagina, 377, 378
Tarnier's forceps, 552
Temperature during puerperium, 271
— of infant, 595
Tetarelle, 598
Third stage, treatment of, 198—206
Threatened abortion, 338—341
Thrush, 623, 624
Transfusion after hæmorrhage, 473—475
Transverse diameter of pelvis, 12
— — measurement of, 79
— presentation, 253—262
Traumatic post-partum hæmorrhage, 463, 464

Trendelenberg's position in prolapse of cord, 458, 459
Triplets, 263
Triradiate pelvis, 414—418
Trophoblast, 87
Tubal abortion, 351
— pregnancy, 350—366
Tumours of ovaries, 440, 441
— of pelvis, 441, 442
— of uterus, 437—439
— of vagina, 439, 440
Twin pregnancy, 263—267

Ulcer, puerperal, 494—497
Umbilical cord, 22, 23
— — anomalies of, 306—308
— — care of, during birth, 194, 195
— — changes in, after birth, 594, 595
— — interlacing and knotting of, in twin labours, 267
— — ligation of, 197, 198
— — presentation and prolapse of, 456—461
— — secondary hæmorrhage from, 618, 619
— grip, 51—53
— souffle, 105
Unavoidable hæmorrhage, 380—388
Unguentum Credè, 508
Ureters, changes in, during pregnancy, 108
Urinary system, maternal, in pregnancy, 98, 99
Uterine inertia, 390—392
— — forceps in, 545, 546
— souffle, 105
Uterus, abnormalities of, in development, 315—317
— — in position, 309—315
— changes in, during pregnancy, 81—91
— — during labour, 127—136
— — during puerperium, 268—270
— contractions of, 123—127
— height of, at different months, 82, 83
— inversion of, acute, 479—481
— rupture of, in labour, 481—485

Vagina, in pregnancy, 92
— bacteria, nature of, 2
— dilatation of, in labour, 138—140
— examination of, in labour, 61—68
— — in pregnancy, 106—108
— prophylactic douching, 6—8
— stenosis of, 444
— tampon of, 377, 378
Varicose veins in pregnancy, 289, 290
Veit's method of treating eclampsia, 329
Venesection in eclampsia, 330, 331
Venous sepsis, 509—511
Version, 554—566
— as a means of inducing labour, 535
— in brow presentation, 229
— in face presentation, 221
— in pelvic deformity, 530, 531
— — presentation, 242, 243
— in placenta prævia, 384
— in prolapse of cord, 460, 461

Version in transverse presentation, 261, 262
Vertex presentation, 153—175
Vesicular mole, 299—303
Vestibule, hæmorrhage from, after labour, 463, 464
Vomiting during pregnancy, 277—281

Walcher's position in contracted pelvis, 432, 433
Wet-nurse, qualifications of, 598, 599
Wharton's jelly, 22, 33
White asphyxia, 609—613
— leg, 520, 521
Wigand's method of performing cephalic version, 555, 556
Winter's modification of Auvard's cranioclast, 585

Ziegenspeck's method in face presentation, 221

PRINTED BY ADLARD AND SON, LONDON AND DORKING

No. 1.

OCT., 1907.

J. & A. CHURCHILL

Recent Works for Students and Practitioners of Medicine.

LONDON:
7, Great Marlborough Street.

INDEX.

PAGE

2 Anatomy. Physiology.
3 Materia Medica. Pharmacy.
4 Hygiene. Bacteriology.
5 Pathology. Psychology. Dictionaries.
6 Medicine.
7 Medicine.
8 Surgery.
9 Surgery. Anæsthetics.
10 Neurology. Urinary Disorders.
11 Midwifery. Gynæcology. Medical Jurisprudence.
12 Ophthalmology.
13 Otology. Pædiatrics. Dentistry.
14 Tropical Diseases. Dermatology.
15 Chemistry. Physics.
16 Microscopy. Miscellaneous.

FREE ON . . .
APPLICATION.

1. Complete Catalogue.
2. Catalogue of Science Books.

A Treatise on Human Anatomy. By various Authors. Edited by HENRY MORRIS, M.A., F.R.C.S., President of the Royal College of Surgeons, England; Consulting Surgeon to the Middlesex Hospital, and J. PLAYFAIR MCMURRICH, A.M., Ph.D., Professor of Anatomy, University of Toronto. Fourth Edition. With 1025 Engravings, of which 319 are printed in 3 or 4 colours. 1548 pp. Royal 8vo, 30*s.* net. Also issued in 5 parts. Parts I, II, and III, 8*s.* net each; and Parts IV and V, 5*s.* net each.

Anatomical Terminology, with Special Reference to the B.N.A. By LLEWELLYS F. BARKER, M.D., Professor of Medicine, Johns Hopkins University, Baltimore. With Illustrations and 2 Coloured Plates. 5*s.* net.

A Manual of Practical Anatomy. By the late Professor ALFRED W. HUGHES, M.B., M.C.Edin., Professor of Anatomy, King's College, London. Edited and completed by ARTHUR KEITH, M.D., Lecturer on Anatomy, London Hospital Medical College. In three parts. 29*s.* 6*d.*

Heath's Practical Anatomy: a Manual of Dissections. Edited by J. ERNEST LANE, F.R.C.S., Surgeon and Lecturer on Anatomy at St. Mary's Hospital. Ninth Edition. 321 Engravings, of which 32 are coloured. 12*s.* 6*d.*

Clinical Applied Anatomy; or, The Anatomy of Medicine and Surgery. By CHARLES R. BOX, M.D., F.R.C.P.Lond., Physician to Out-patients, St. Thomas's Hospital, and W. MCADAM ECCLES, M.S.Lond., F.R.C.S.Eng., Assistant Surgeon, St. Bartholomew's Hospital. Illustrated by 45 Plates, of which 12 are coloured, and 6 Figures in the Text. 12*s.* 6*d.* net.

Essentials of Surface Anatomy. By CHARLES R. WHITTAKER, L.R.C.S., L.R.C.P., etc., Demonstrator of Anatomy, Surgeons' Hall, Edinburgh. 2*s.* 6*d.* net.

Text-Book of Anatomy for Nurses. By ELIZABETH R. BUNDY, M.D., Member of the Medical Staff of the Woman's Hospital of Philadelphia. With a Glossary and 191 Illustrations, 34 of which are printed in colours. 7*s.* 6*d.* net.

Human Osteology. By LUTHER HOLDEN. Eighth Edition. Edited by CHARLES STEWART, F.R.S., Conservator of the Museum R.C.S., and ROBERT W. REID, M.D., F.R.C.S., Regius Professor of Anatomy in the University of Aberdeen. 59 Lithographic Plates and 74 Engravings. 16*s.*

By the same Author.

Landmarks, Medical and Surgical. Fourth Edition. 3*s.* 6*d.*

Elements of Human Physiology. By ERNEST H. STARLING, M.D., F.R.C.P., F.R.S., Jodrell Professor of Physiology in University College, London. Eighth Edition. 323 Illustrations. 12*s.* 6*d.* net.

Practical Physiological Chemistry. By PHILIP B. HAWK, M.S., Ph.D., Demonstrator of Physiological Chemistry in the University of Pennsylvania. With Coloured Plates and 126 Figures. 16*s.* net.

Physiological Chemistry. By CHARLES E. SIMON, M.D. Second Edition. 14*s.* net.

Materia Medica & Pharmacy

A Text-Book of Materia Medica. By C. R. MARSHALL, M.D., Professor of Materia Medica and Therapeutics in the University of St. Andrews. 127 Illustrations. 10*s.* 6*d.* net.

Materia Medica, Pharmacy, Pharmacology, and Therapeutics. By W. HALE WHITE, M.D., F.R.C.P., Physician to, and Lecturer on Medicine at, Guy's Hospital. Tenth Edition. 6*s.* 6*d.* net.

Southall's Organic Materia Medica. Edited by JOHN BARCLAY, B.Sc.Lond. Sixth Edition. Adapted to the B.P. of 1898. 7*s.* 6*d.*

An Introduction to the Study of Materia Medica. By HENRY G. GREENISH, F.I.C., F.L.S., Professor of Pharmaceutics to the Pharmaceutical Society. 213 Illustrations. 15*s.*

By the same Author.

The Microscopical Examination of Foods and Drugs. 168 Illustrations. 10*s.* 6*d.* net.

Also, with Mr. Eugene Collin.

An Anatomical Atlas of Vegetable Powders. 138 Illustrations. 12*s.* 6*d.* net.

Practical Pharmacy. By E. W. LUCAS, F.I.C., F.C.S. 283 Illustrations. 12*s.* 6*d.*

The National Standard Dispensatory. By H. A. HARE, B.Sc., M.D., and others. 478 Illustrations. 31*s.* 6*d.* net.

Medical and Pharmaceutical Latin for Students of Pharmacy and Medicine. By REGINALD R. BENNETT, Pharmacist and Teacher of Pharmacy at University College Hospital, London. 6*s.* net.

A Companion to the British Pharmacopœia. By PETER WYATT SQUIRE, F.L.S., F.C.S. Seventeenth Edition. 12*s.* 6*d.* Pocket Edition, 7*s.* 6*d.* net.

The Pharmaceutical Formulary: a Synopsis of the British and Foreign Pharmacopœias. By HENRY BEASLEY. Twelfth Edition by J. OLDHAM BRAITHWAITE. 6*s.* 6*d.*

By the same Author.

The Book of Prescriptions (Beasley), with an Index of Diseases and Remedies. Rewritten by E. W. LUCAS, F.I.C., F.C.S. With an Introduction by ARTHUR LATHAM, M.D., F.R.C.S. Ninth Edition. 6*s.* net.

The Book of Receipts: containing a Veterinary Materia Medica, with Prescriptions illustrating the Employment of Drugs in General Use for the Treatment of the more Common Ailments of Animals; comprising also a Pharmaceutical Formulary for the Manufacture of Proprietary Articles, Toilet Preparations, Dietetic Articles, Household Specialities, etc. A Photographic Formulary. A Synopsis of Practical Methods employed in the Examination of Urine, Milk, Potable Waters, Sputum, etc., together with numerous Chemical and other Tables likely to be of use to Pharmacists and Manufacturers. (The Eleventh Edition of Beasley's Book.) With 10 Plates. Crown 8vo, 7*s.* 6*d.* net.

Tuson's Veterinary Pharmacopœia, including the Outlines of Materia Medica and Therapeutics. Sixth Edition. Edited by JAMES BAYNE, F.C.S. 7*s.* 6*d.* net.

Year-Book of Pharmacy: containing the Trans-actions of the British Pharmaceutical Conference. Annually, 10*s.*

Hygiene & Bacteriology

The Theory and Practice of Hygiene. (Notter and Firth.) By J. Lane Notter, M.D., late Professor of Hygiene in the Army Medical School; and W. H. Horrocks, M.B., B.Sc., Assistant Professor of Military Hygiene in the Staff Medical College. Second Edition. 15 Plates and 134 other Illustrations. 25*s.*

Manual of Hygiene. By W. H. Hamer, M.D., D.P.H., F.R.C.P., Lecturer on Public Health, St. Bartholomew's Hospital, Assistant Medical Officer of Health of the Administrative County of London. 93 Illustrations. 12*s.* 6*d.* net.

A Handbook of Hygiene and Sanitary Science. By Geo. Wilson, M.A., M.D., LL.D., D.P.H.Camb. Medical Officer of Health for Mid-Warwickshire. Eighth Edition. Illustrated. 12*s.* 6*d.*

The Effects of Borax and Boric Acid on the Human System. Third Treatise. With Diagrams. By Dr. Oscar Liebreich. 5*s.* net.

A Simple Method of Water Analysis. By John C. Thresh, M.D.Vic., D.Sc.Lond., D.P.H.Camb. Fifth Edition, enlarged. 2*s.* 6*d.*

By the same Author.

The Examination of Waters and Water Supplies. 19 Plates and 11 Figures in the Text. 14*s.* net.

Also, with Arthur E. Porter, M.D., M.A.Cantab.

Preservatives in Food and Food Examination. 8 Plates. 14*s.* net.

Foods and their Adulteration: Origin, Manufacture, and Composition of Food Products; Description of Common Adulterations, Food Standards, and National Food Laws and Regulations. By Harvey W. Wiley, M.D., Ph.D. With 11 Coloured Plates and 86 other Illustrations. 21*s.* net.

A Manual of Bacteriology, Clinical and Applied. By Richard T. Hewlett, M.D., Professor of General Pathology and Bacteriology in King's College, London. Second Edition. 20 Plates and 66 Figures in the Text. 12*s.* 6*d.*

By the same Author.

Serum Therapy, Bacterial Therapeutics, and Vaccines. 20 Figures. 5*s.* net.

Clinical Diagnostic Bacteriology, including Serum- and Cyto-diagnosis. By Alfred C. Coles, M.D., D.Sc., F.R.S.E. 2 Coloured Plates. 8*s.* net.

A Text-Book of Bacteriology. By G. M. Sternberg, M.D. Second Edition. 9 Plates and 198 Figures in the Text. 26*s.*

An Introduction to the Bacteriological Examination of Water. By W. H. Horrocks, M.B., B.Sc.Lond., Assistant Professor of Military Hygiene in the Staff Medical College, Major R.A.M.C. 5 Lithographic Plates. 10*s.* 6*d.*

Lessons in Disinfection and Sterilisation. By F. W. Andrewes, M.D., F.R.C.P., Lecturer on Pathology, St. Bartholomew's Hospital. Second Edition. 31 Illustrations. 3*s.* 6*d.* net.

Pathology & Psychology Dictionaries

Pathology, General and Special, for Students of Medicine. By R. Tanner Hewlett, M.D., F.R.C.P., D.P.H., Professor of General Pathology and Bacteriology in King's College, London. 28 Plates and 13 Illustrations in Text. Second Edition. Post 8vo. 10*s.* 6*d.* net.

A Manual of General or Experimental Pathology. By W. S. Lazarus-Barlow, M.D., F.R.C.P., Director of the Cancer Research Laboratories, Middlesex Hospital. Second Edition. 21*s.* net.

By the same Author.

The Elements of Pathological Anatomy and Histology for Students. 7 Coloured Plates and 171 Figures in the Text. 24*s.* net.

Surgical Pathology and Morbid Anatomy. See p. 8.

The Pathologist's Handbook: a Manual for the Post-mortem Room. By T. N. Kelynack, M.D. 126 Illustrations. Pegamoid, 4*s.* 6*d.*

Psychological Medicine: a Manual of Mental Diseases. By Maurice Craig, M.A., M.D., F.R.C.P., Physician and Lecturer on Mental Diseases, Guy's Hospital. 22 Plates. 12*s.* 6*d.* net.

Mental Diseases: Clinical Lectures. By T. S. Clouston, M.D., F.R.C.P.Edin., Lecturer on Mental Diseases in the University of Edinburgh. Sixth Edition. 30 Plates. 14*s.* net.

The Force of Mind; or, the Mental Factor in Medicine. By Alfred T. Schofield, M.D., Hon. Physician to Friedenheim Hospital. Third Edition. 5*s.* net.

By the same Author.

Unconscious Therapeutics; or, The Personality of the Physician. Second Edition. 5*s.* net.

Also

The Management of a Nerve Patient. 5*s.* net.

The Journal of Mental Science. Published Quarterly, by Authority of the Medico-Psychological Association. 5*s.*

Dictionary of Medical Terms: English, French, German. Edited by Paul Blaschke. 8*s.* net.

Dictionary of Medical Conversation; English- German, 4*s.* net. German-English, 4*s.* net.

A German-English Dictionary of Terms used in Medicine and the Allied Sciences. By Hugo Lang, B.A., and Bertram Abrahams, M.B., B.Sc., F.R.C.P. 15*s.* net.

Dunglison's Dictionary of Medical Science. By Thomas L. Stedman, A.M., M.D. Twenty-third Edition. 577 Illustrations, including 84 page-plates. 34*s.* net.

A Medical Vocabulary. By R. G. Mayne, M.D., LL.D. Seventh Edition, by W. W. Wagstaffe, B.A., F.R.C.S., and G. D. Parker, M.B. 12*s.* 6*d.*

Medicine

A Text-Book of Medicine. Begun by the late C. Hilton Fagge, M.D.; completed and re-written by P. H. Pye-Smith, M.D., F.R.S. Fourth Edition. 2 vols. 42*s*.

Manual of the Practice of Medicine. By Frederick Taylor, M.D., F.R.C.P., Physician to, and Lecturer on Medicine at, Guy's Hospital. Seventh Edition. Illustrated. 15*s*. net.

A System of Clinical Medicine for Practitioners and Students, giving an account of the Diagnosis, Prognosis, and Treatment of Disease. By Thos. D. Savill, M.D., M.R.C.P. In 2 vols. 4 Coloured Plates, and 286 Figures in the Text. Vol. I: Local Diseases and Pyrexial Disorders, 12*s*. 6*d*. net; Vol. II: Diseases of the Skin, the Nervous System, etc., 8*s*. 6*d*. net.

A Short Practice of Medicine. By Robert A. Fleming, M.A., M.D., F.R.C.P.E, F.R.S.E., Lecturer on Practice of Medicine, School of the Royal Colleges, Edinburgh; Assistant Physician, Royal Infirmary, Edinburgh. Illustrated, partly in colour. 10*s*. 6*d*. net.

The Practice of Medicine. By M. Charteris, M.D., Professor of Therapeutics and Materia Medica in the University of Glasgow. Eighth Edition. Edited by F. J. Charteris, M.B., Ch.B. Illustrated. 10*s*.

Student's Guide to Medical Diagnosis. By Samuel Fenwick, M.D., F.R.C.P., and W. Soltau Fenwick, M.D., B.S. Ninth Edition. 139 Engravings. 9*s*.

Text-Book of Medical Treatment (Diseases and Symptoms). By Nestor I. C. Tirard, M.D., F.R.C.P., Professor of the Principles and Practice of Medicine, King's College, London. 15*s*.

A Manual of Family Medicine and Hygiene for India. Published under the Authority of the Government of India. By Sir William J. Moore, K.C.I.E., M.D. Seventh Edition revised by Major J. H. Tull Walsh, I.M.S. 70 Engravings. 6*s*. net.

The Blood: how to Examine and Diagnose its Diseases. By Alfred C. Coles, M.D., D.Sc., F.R.S.Edin. Third Edition. 7 Coloured Plates. 10*s*. 6*d*. net.

Lectures on Medicine to Nurses. By Herbert E. Cuff, M.D., F.R.C.S., late Medical Superintendent, North-Eastern Fever Hospital, London. Fifth Edition. 29 Illustrations. 3*s*. 6*d*. net.

How to Examine the Chest: a Practical Guide for the use of Students. By Samuel West, M.D., F.R.C.P., Physician to St. Bartholomew's Hospital. Third Edition. 46 Engravings. 5*s*.

Ulcer of the Stomach and Duodenum. By Samuel Fenwick, M.D., F.R.C.P., and W. Soltau Fenwick, M.D., B.S. 55 Illustrations. 10*s*. 6*d*.

Medicine

By the same Authors.

Cancer and other Tumours of the Stomach. 70
Illustrations. 10*s.* 6*d.*

On Carbohydrate Metabolism, with an Appendix on the Assimilation of Carbohydrate into Proteid and Fat, followed by the Fundamental Principles and the Treatment of Diabetes dialectically discussed. By FREDERICK W. PAVY, M.D., LL.D., F.R.S., F.R.C.P., Consulting Physician to Guy's Hospital. With 8 Plates. Demy 8vo. 6*s.* net.

The Schott Methods of the Treatment of Chronic Diseases of the Heart, with an account of the Nauheim Baths, and of the Therapeutic Exercises. By W. BEZLY THORNE, M.D., M.R.C.P. Fifth Edition. Illustrated. 5*s.* net.

The Clinical Examination of Urine, with an Atlas of Urinary Deposits. By LINDLEY SCOTT, M.A., M.D. 41 original Plates (mostly in colours). 15*s.* net.

Urinary Examination made easy: a Method of Examining Urine, with the common Tests fully described. By THOMAS CARRUTHERS, M.B., Ch.B. 1*s.* 6*d.* net.

Some Disorders of the Spleen. By FREDERICK TAYLOR, M.D., F.R.C.P., Physician to, and Lecturer on Medicine at, Guy's Hospital; Examiner in Medicine at the University of London. Lumleian Lectures delivered before the Royal College of Physicians, London. 3*s.* net.

Rational Organotherapy, with Reference to Urose- miology. Translated from the Russian Text by Professor Dr. A. VON POEHL, Professor Prince J. VON TARCHANOFF, Dr. ALF VON POEHL, and Dr. P. WACHS. Vol. I. 8vo. 7*s.* 6*d.* net.

On Gallstones, or Cholelithiasis. By E. M. BROCKBANK, M.D.Vict., M.R.C.P.Lond., Honorary Physician to the Ancoats Hospital, Manchester. 7*s.*

Obstinate Hiccough: the Physiology, Pathology, and Treatment, based on a collection of over 150 cases from British and Foreign Works. By L. F. B. KNUTHSEN, M.D.Edin. 6*s.*

On Syphonage and Hydraulic Pressure in the Large Intestine, with their Bearing upon the Treatment of Constipation, Appendicitis, etc. By RALPH WINNINGTON LEFTWICH, M.D. 3*s.* net.

Uric Acid as a Factor in the Causation of Disease. By ALEXANDER HAIG, M.D., F.R.C.P., Physician to the Metropolitan Hospital and the Royal Hospital for Children and Women. Sixth Edition. 75 Illustrations. 15*s.*

By the same Author.

Uric Acid, an Epitome of the Subject. Second Edition. 2*s.* 6*d.* net.

Also

Diet and Food considered in relation to Strength and Power of Endurance, Training, and Athletics. Sixth Edition. 2*s.* net.

Surgery

The Operations of Surgery. By W. H. A. Jacobson, M.Ch.Oxon., F.R.C.S., Consulting Surgeon Guy's Hospital, and R. P. Rowlands, M.S.Lond., F.R.C.S., Assistant Surgeon and Surgeon to the Orthopædic Department, Guy's Hospital. Fifth Edition. 2 vols. 777 Illustrations. 42*s.* net.

Surgery: its Theory and Practice. By William J. Walsham, F.R.C.S., Surgeon to St. Bartholomew's Hospital. Ninth Edition, by W. G. Spencer, F.R.C.S., Surgeon to the Westminster Hospital. 620 Engravings (including 24 Skiagrams). 18*s.* net.

The Operative Surgery of Malignant Disease. By Henry T. Butlin, F.R.C.S., Surgeon to St. Bartholomew's Hospital. Second Edition. 12 Engravings. 14*s.*

Surgical Pathology and Morbid Anatomy. By Anthony A. Bowlby, F.R.C.S., Surgeon to St. Bartholomew's Hospital, assisted by F. W. Andrewes, M.D., Lecturer on Pathology, St. Bartholomew's Hospital. Fifth Edition. 196 Engravings. 10*s.* 6*d.* net.

A Manual of Surgical Diagnosis. By James Berry, B.S.Lond., F.R.C.S., Surgeon to, and Lecturer on Surgery at, the Royal Free Hospital. 6*s.* net.

A Synopsis of Surgery. By R. F. Tobin, Surgeon to St. Vincent's Hospital, Dublin. Second Edition. Interleaved, leather binding. 6*s.* 6*d.*

On Diseases of the Rectum and Anus, including the Fifth Edition of the Jacksonian Prize Essay on Cancer. By Harrison Cripps, F.R.C.S., Senior Surgeon, St. Bartholomew's Hospital. Third Edition. With 13 Plates and 34 Illustrations. 10*s.* 6*d.* net.

Also

Cancer of the Rectum, especially considered with regard to its Surgical Treatment. Jacksonian Prize Essay. Fifth Edition. With 13 Plates and several Engravings. 5*s.* net.

Heath's Manual of Minor Surgery and Ban-daging. Thirteenth Edition. Revised by Bilton Pollard, F.R.C.S., Surgeon to University College Hospital. 198 Engravings. 6*s.* net.

By the same Author.

Injuries and Diseases of the Jaws. Fourth Edition. Edited by Henry Percy Dean, M.S., F.R.C.S., Assistant Surgeon to the London Hospital. 187 Wood Engravings. 14*s.*

Also

Clinical Lectures on Surgical Subjects delivered at University College Hospital. First Series, 6*s.*; Second Series, 6*s.*

An Essay on the General Principles of the Treat-ment of Spinal Curvatures. By R. Heather Bigg. Illustrated by Photographs and Sketches. 5*s.* net.

Surgery ∅ Anæsthetics

The Surgery of the Alimentary Canal. By Alfred Ernest Maylard, M.B.Lond. and B.S., Senior Surgeon to the Victoria Infirmary, Glasgow. 27 Swantype Plates and 89 Figures in the Text. 25*s*.

By the same Author.

A Student's Handbook of the Surgery of the Alimentary Canal. 97 Illustrations. 8*s*. 6*d*.

Also

Abdominal Pain: its Causes and Clinical Significance. Second Edition. 7*s*. 6*d*. net.

Clinical Essays and Lectures. By Howard Marsh, F.R.C.S., Professor of Surgery in the University of Cambridge, late Surgeon to St. Bartholomew's Hospital. 26 Illustrations. 7*s*. 6*d*.

Ovariotomy and Abdominal Surgery. By Harrison Cripps, F.R.C.S., Surgical Staff, St. Bartholomew's Hospital. Numerous Plates. 25*s*.

Diseases of the Thyroid Gland and their Surgical Treatment. By James Berry, B.S.Lond., F.R.C.S., Surgeon to the Royal Free Hospital and Lecturer on Surgery at the London School of Medicine for Women. 121 Illustrations. 14*s*.

Hare-lip and Cleft Palate. By R. W. Murray, F.R.C.S., Surgeon, David Lewis Northern Hospital, late Surgeon, Liverpool Infirmary for Children. 25 Illustrations. 3*s*.

Modern Bullet-Wounds and Modern Treatment, with Special Regard to Long Bones and Joints, Field Appliances and First Aid. Part of the Alexander Essay for 1903. By Major F. Smith, D.S.O., R.A.M.C. 3*s*. net.

Surgical Emergencies: together with the Emergencies attendant on Parturition and the Treatment of Poisoning. By Paul Swain, F.R.C.S., Surgeon to the South Devon and East Cornwall Hospital. Fifth Edition. 149 Engravings. 6*s*.

The Accessory Sinuses of the Nose, their Surgical Anatomy and the Diagnosis and Treatment of their Inflammatory Affections. By A. Logan Turner, M.D.Edin., Surgeon for Diseases of the Ear and Throat, Deaconess Hospital, Edinburgh. 81 Illustrations. 12*s*. net.

On the Development and Anatomy of the Prostate Gland, with an Account of its Injuries and Diseases and their Surgical Treatment. By W. G. Richardson, M.B., B.S., F.R.C.S., Assistant Surgeon at the Royal Infirmary, Newcastle-on-Tyne, Assistant Demonstrator of Operative Surgery at the University of Durham College of Medicine. Heath Scholarship Prize Essay. 47 Plates. 10*s*. 6*d*. net.

Chloroform: a Manual for Students and Practitioners. By Edward Lawrie, M.B.Edin., Lieut.-Col. I.M.S., Residency Surgeon, Hyderabad. Illustrated. 5*s*. net.

A Guide to Anæsthetics for the Student and General Practitioner. By Thomas D. Luke, M.B., F.R.C.S., Edinburgh. Third Edition. 43 Engravings. 5*s*. net.

Paralysis and other Nervous Diseases in Childhood and Early Life. By JAMES TAYLOR, M.D., F.R.C.P., Physician, National Hospital for Paralysed and Epileptic, Queen Square. 74 Illustrations. 12*s*. 6*d*. net.

A Manual of Diseases of the Nervous System. By SIR WILLIAM R. GOWERS, M.D., F.R.S.

VOL. I.—Nerves and Spinal Cord. Third Edition, by the Author and JAMES TAYLOR, M.D., F.R.C.P. 192 Engravings. 15*s*.

VOL. II.—Brain and Cranial Nerves: General and Functional Diseases of the Nervous System. Second Edition. 182 Engravings. 20*s*.

By the same Author.

Clinical Lectures on Diseases of the Nervous System. 7*s*. 6*d*.

Also

Subjective Sensations of Sight and Sound, Abiotrophy, and other Lectures on Diseases of the Nervous System. 18 Illustrations. 6*s*. net.

Also

Epilepsy and Other Chronic Convulsive Diseases: their Causes, Symptoms, and Treatment. Second Edition. 10*s*. 6*d*.

Text-Book of Nervous Diseases for Students and Practitioners of Medicine. By CHARLES L. DANA, M.D., Professor of Nervous and Mental Diseases in Bellevue Hospital Medical College, New York. Fourth Edition. 246 Illustrations. 20*s*.

The Treatment of Nervous Disease. By J. J. GRAHAM BROWN, M.D., F.R.C.P.E., F.R.S.E., Assistant Physician, Royal Infirmary of Edinburgh. 15*s*. net.

Selected Papers on Stone, Prostate, and other Urinary Disorders. By REGINALD HARRISON, F.R.C.S., Surgeon to St. Peter's Hospital. 15 Illustrations. 5*s*.

Obscure Diseases of the Urethra. By E. HURRY FENWICK, F.R.C.S., Surgeon to the London Hospital. 63 Illustrations. 6*s*. 6*d*.

By the same Author.

Obscure Diseases of the Kidney, the Value of Ureteric Meatoscopy in their Diagnosis and Treatment. Based on 400 Major Operations on the Kidney. 14 Plates and 43 Figures in the Text. 6*s*. 6*d*.

Also

Operative and Inoperative Tumours of the Urinary Bladder: a Clinical and Operative Study based on 500 cases. 39 Illustrations. 5*s*. net.

Also

Tumours of the Urinary Bladder. Fas. I. 5*s*. net.

Also

Ulceration of the Bladder, Simple, Tuberculous, and Malignant: a Clinical Study. Illustrated. 5*s*.

Also

A Handbook of Clinical Cystoscopy. 31 Plates and 144 Figures in the Text. 18*s*. net.

Also

Atlas of Electric Cystoscopy. 34 Coloured Plates. 21*s*. net.

Midwifery & Gynæcology
Medical Jurisprudence

Manual of Midwifery, including all that is likely to be required by Students and Practitioners. By Alfred L. Galabin, M.A., M.D., F.R.C.P., Consulting Obstetric Physician to Guy's Hospital. Sixth Edition. 329 Engravings. 14*s.* net.

Manual of Midwifery. By T. W. Eden, M.D., C.M.Edin., F.R.C.P.Lond., Assistant Obstetric Physician and Lecturer on Practical Midwifery, Charing Cross Hospital. 26 Plates and 233 Illustrations in the Text. 10*s.* 6*d.* net.

A Short Practice of Midwifery, embodying the Treatment adopted in the Rotunda Hospital, Dublin. By Henry Jellett, M.D., B.A.O.Dub., Ex-Assistant Master, Rotunda Hospital. Fourth Edition. 152 Illustrations. 8*s.* 6*d.*

By the same Author.

A Short Practice of Midwifery for Nurses, with a Glossary of the Medical Terms used in the Book. Second Edition. 4 Coloured Plates and 134 Illustrations. 6*s.* 6*d.* net.

Essentials of Obstetrics. By J. W. Ballantyne, M.D., F.R.C.P.E., F.R.S.E., Examiner in Midwifery in the University of Edinburgh. 5*s.* net.

A Short Manual for Monthly Nurses. By Charles J. Cullingworth, M.D., F.R.C.P., Obstetric Physician to St. Thomas's Hospital. Fifth Edition. 1*s.* 6*d.*

Diseases of Women. By Alfred L. Galabin, M.A., M.D., F.R.C.P., Consulting Obstetric Physician to Guy's Hospital. Sixth Edition. 284 Engravings. 16*s.* net.

A Short Practice of Gynæcology. By Henry Jellett, M.D., B.A.O.Dub. Second Edition. 225 Illustrations. 10*s.* 6*d.*

Essentials of Gynæcology. By J. W. Ballantyne, M.D., F.R.C.P.E., F.R.S.E., Lecturer on Midwifery and Diseases of Women and Children in Surgeons' Hall, and in the Medical College for Women, Edinburgh. 5*s.* net.

Outlines of Gynæcological Pathology and Morbid Anatomy. By C. Hubert Roberts, M.D.Lond., Physician to the Samaritan Free Hospital for Women. 151 Illustrations. 21*s.*

Lectures on Medical Jurisprudence and Toxicology. By Fred. J. Smith, M.D., F.R.C.P., Lecturer on Forensic Medicine and Toxicology at the London Hospital. 7*s.* 6*d.*

Medical Jurisprudence: its Principles and Practice. By Alfred S. Taylor, M.D., F.R.C.P., F.R.S. Fifth Edition, by Fred. J. Smith, M.D., F.R.C.P., Lecturer on Medicine at the London Hospital. 2 vols. 39 Engravings. 36*s.* net.

Ophthalmology

Nettleship's Diseases of the Eye. Sixth Edition. Revised and Edited by W. T. Holmes Spicer, M.B., F.R.C.S., Ophthalmic Surgeon to St. Bartholomew's Hospital; Surgeon to the Royal London Ophthalmic Hospital. 161 Engravings and a Coloured Plate illustrating Colour-Blindness. 8*s*. 6*d*.

Medical Ophthalmoscopy: a Manual and Atlas. By William R. Gowers, M.D., F.R.C.P., F.R.S. Fourth Edition. Edited with the assistance of Marcus Gunn, M.B., F.R.C.S., Surgeon to the Royal London Ophthalmic Hospital. Autotype Plates and Woodcuts. 14*s*. net.

Manual of Ophthalmic Surgery and Medicine. By W. H. H. Jessop, M.A., F.R.C.S., Ophthalmic Surgeon to St. Bartholomew's Hospital. 5 Coloured Plates and 110 Woodcuts. 9*s*. 6*d*.

Practical Handbook of Diseases of the Eye. By D. Chalmers Watson, M.B., Ophthalmic Physician, Marshall Street Dispensary, Edinburgh. Second Edition. 9 Coloured Plates and 31 Figures in the Text. 5*s*. net.

Diseases of the Eye: a Practical Handbook for General Practitioners and Students. By Cecil Edward Shaw, M.D., M.Ch., Ophthalmic Surgeon to the Ulster Hospital for Children and Women, Belfast. With a Test-Carû for Colour Blindness. 3*s*. 6*d*.

Refraction of the Eye: a Manual for Students. By Gustavus Hartridge, F.R.C.S., Surgeon to the Royal Westminster Ophthalmic Hospital. Fourteenth Edition. 109 Illustrations, also Test-types, etc. 5*s*. net.

By the same Author.

The Ophthalmoscope: a Manual for Students. Fifth Edition. 68 Illustrations and 4 Plates. 4*s*. net.

Diseases of the Eye: a Manual for Students and Practitioners. By J. Herbert Parsons, D.Sc., M.B., B.S., F.R.C.S., Assistant Ophthalmic Surgeon, University College Hospital; Assistant Surgeon, Royal London (Moorfields) Ophthalmic Hospital. 308 Illustrations and 15 Plates. 10*s*. 6*d*. net.

By the same Author.

Elementary Ophthalmic Optics, including Ophthal-moscopy and Retinoscopy. 66 Illustrations. 6*s*. 6*d*.

Royal London Ophthalmic Hospital Reports. By the Medical and Surgical Staff. Vol. XVII, Part I. 5*s*. net.

Ophthalmological Society of the United Kingdom. Transactions. Vol. XXVI. 12*s*. 6*d*. net.

Otology ⸗ Pædiatrics ⸗ Dentistry

The Labyrinth of Animals, including Mammals, Birds, Reptiles, and Amphibians. By ALBERT A. GRAY, M.D.(Glas.), F.R.S.E., Surgeon for Diseases of the Ear to the Victoria Infirmary, Glasgow. Vol. I, with 31 Stereoscopic Plates. 21*s.* net (including Stereoscope).

Some Points in the Surgical Anatomy of the Temporal Bone from Birth to Adult Life. By ARTHUR H. CHEATLE, F.R.C.S., Aural Surgeon to King's College Hospital. 112 Illustrations. 5*s.* net.

Diseases of the Ear. By T. MARK HOVELL, Senior Aural Surgeon to the London Hospital, and Lecturer on Diseases of the Throat in the College. Second Edition. 128 Engravings. 21*s.*

The Diseases of Children. By JAMES F. GOODHART, M.D., F.R.C.P., and G. F. STILL, M.D., F.R.C.P., Professor of the Diseases of Children, King's College. Eighth Edition. 12*s.* 6*d.* net.

The Wasting Diseases of Infants and Children. By EUSTACE SMITH, M.D., F.R.C.P., Physician to the King of the Belgians, and to the East London Hospital for Children. Sixth Edition. 6*s.*

On the Natural and Artificial Methods of Feeding Infants and Young Children. By EDMUND CAUTLEY, M.D., Physician to the Belgrave Hospital for Children. Second Edition. 7*s.* 6*d.*

Dental Anatomy, Human and Comparative: a Manual. By CHARLES S. TOMES, M.A., F.R.S. Sixth Edition. 286 Engravings. 12*s.* 6*d.* net.

By the same Author.

A System of Dental Surgery. By Sir JOHN TOMES, F.R.S. Revised by C. S. TOMES, M.A., F.R.S., and WALTER S. NOWELL, M.A.Oxon. Fifth Edition. 318 Engravings. 15*s.* net.

Practical Treatise on Mechanical Dentistry. By JOSEPH RICHARDSON, M.D., D.D.S. Seventh Edition, revised and edited by GEORGE W. WARREN, D.D.S. 690 Engravings. 22*s.*

Decay in Teeth: an Investigation into its Cause and Prevention. By J. SIM WALLACE, M.D., D.Sc., L.D.S.R.C.S. Second Edition. 5*s.*

A Manual of Dental Metallurgy. By ERNEST A. SMITH, Assay Office, Sheffield. Second Edition. 38 Illustrations. 6*s.* 6*d.*

Dental Materia Medica, Pharmacology and Thera- peutics. By CHARLES W. GLASSINGTON, M.R.C.S., L.D.S.Edin.; Senior Dental Surgeon, Westminster Hospital; Dental Surgeon, National Dental Hospital, and Lecturer on Dental Materia Medica and Therapeutics to the College. 6*s.*

Tropical Diseases & Dermatology

The Malarial Fevers of British Malaya. By Hamilton Wright, M.D. (McGill), Director of the Institute for Medical Research, Federated Malay States. Map and Charts. 3*s.* net.

By the same Author.

The Etiology and Pathology of Beri Beri. With Map and Charts. 3*s.* net.

Beri-Beri: its Symptoms and Symptomatic Treatment. By Percy N. Gerrard, M.D., District Surgeon, Federated Malay States Civil Service. 2*s.* 6*d.* net.

By the same Author.

Extracts from the above. 1*s.* 6*d.* net.

On the Causes and Continuance of Plague in Hong Kong, with Suggestions as to Remedial Measures; a Report presented to the Secretary of State for the Colonies. By W. J. Simpson, M.D., F.R.C.P. Numerous Charts and Diagrams. 10*s.* net.

On the Outbreak of Yellow Fever in British Honduras in 1905, together with an Account of the Distribution of the Stegomyia fasciata in Belize, and the Measures necessary to Stamp Out or Prevent the Occurrence of Yellow Fever; a Report presented to the Government of that Colony. By Rupert Boyce, M.B., F.R.S. Illustrated with numerous Plates and Plans. Folio. 3*s.* 6*d.* net.

A Handbook on Leprosy. By S. P. Impey, M.D., late Chief and Medical Superintendent, Robben Island Leper and Lunatic Asylums, Cape Colony. 38 Plates. 12*s.*

A Manual of Diseases of the Skin, with an Analysis of 20,000 Consecutive Cases and a Formulary. By Duncan E. Bulkley, M.D., New York. Fourth Edition. 6*s.* 6*d.*

Skin Diseases of Children. By Geo. H. Fox, M.D., Clinical Professor of Diseases of the Skin, College of Physicians and Surgeons, New York. 12 Photogravure and Chromographic Plates and 60 Illustrations in the Text. 12*s.* 6*d.*

On Maternal Syphilis, including the Presence and Recognition of Syphilitic Pelvic Disease in Women. By John A. Shaw-Mackenzie, M.D. Coloured Plates. 10*s.* 6*d.*

The Diagnosis and Treatment of Syphilis. By Tom Robinson, M.D.St. And., Physician to the Western Skin Hospital. Second Edition. 3*s.* 6*d.*

By the same Author.

The Diagnosis and Treatment of Eczema. Second Edition. 3*s.* 6*d.*

Ringworm, and some other Scalp Affections: their Cause and Cure. By Haydn Brown, L.R.C.P.Ed. 5*s.*

Chemistry, Inorganic and Organic. By CHARLES L. BLOXAM. Ninth Edition, by JOHN MILLAR THOMSON, F.R.S., Professor of Chemistry in King's College, London, and ARTHUR G. BLOXAM, F.I.C. 284 Engravings. 18*s*. net.

The Elements of Chemistry. By M. M. PATTISON MUIR, M.A., Fellow and Praelector in Chemistry of Gonville and Caius College Cambridge. Illustrated. 10*s*. 6*d*. net.

The Analyst's Laboratory Companion: a Collection of Tables and Data for Chemists and Students. By ALFRED E. JOHNSON, B.Sc., F.I.C. Third Edition. 6*s*. 6*d*. net.

Commercial Organic Analysis: a Treatise on the Properties, Modes of Assaying, Proximate Analytical Examination, etc., of the various Organic Chemicals and Products employed in the Arts, Manufactures, Medicine, etc. By ALFRED H. ALLEN, F.I.C. In 8 vols. £6 16*s*. [Prospectus on application.]

Volumetric Analysis; or, the Quantitative Estima- tion of Chemical Substances by Measure. By FRANCIS SUTTON, F.C.S., F.I.C. Ninth Edition. 121 Engravings. 20*s*. net.

A Manual of Chemistry, Theoretical and Practical. By WILLIAM A. TILDEN, D.Sc., F.R.S., Professor of Chemistry in the Royal College of Science, London. 2 Plates and 143 Woodcuts. 10*s*.

Valentin's Practical Chemistry and Qualitative and Quantitative Analysis. Edited by Dr. W. R. HODGKINSON, F.R.S.E. Tenth Edition. (*In the press.*)

A Handbook of Physics and Chemistry, for the first examination of the Conjoint Board. By HERBERT E. CORBIN, B.Sc.Lond., and ARCHIBALD M. STEWART, B.Sc.Lond. Third Edition. 165 Illustrations. 6*s*. 6*d*. net.

A Treatise on Physics. By ANDREW GRAY, LL.D., F.R.S., Professor of Natural Philosophy in the University of Glasgow. Vol. I. Dynamics and Properties of Matter. 350 Illustrations. 15*s*.

Practical Chemistry and Qualitative Analysis. By FRANK CLOWES, D.Sc.Lond., Emeritus Professor of Chemistry in the University College, Nottingham. Seventh Editon. 101 Engravings. 8*s*. 6*d*.

Quantitative Analysis. By FRANK CLOWES, D.Sc.Lond., and J. BERNARD COLEMAN, R. C. Sc. Dublin; Professor of Chemistry, South-West London Polytechnic. Seventh Edition. 125 Engravings. 10*s*.

By the same Authors.

Elementary Practical Chemistry. Fifth Edition.
Part I. General Chemistry. 75 Engravings. 2*s*. 6*d*. net.
Part II. Analytical Chemistry. 20 Engravings. 2*s*. 6*d*. net.

Introduction to Chemical Analysis. By HUGH C. H. CANDY, B.A., B.Sc., F.I.C., Lecturer on Chemistry in the London Hospital Medical College, Analyst to the London Hospital. 3*s*. 6*d*. net.

Researches on the Affinities of the Elements and on the Causes of the Chemical Similarity or Dissimilarity of Elements and Compounds. By GEOFFREY MARTIN, B.Sc.Lond. Illustrated. 16*s*. net.

Microscopy & Miscellaneous

The Microscope and its Revelations. By the late William B. Carpenter, C.B., M.D., LL.D., F.R.S. Eighth Edition, by the Rev. W. H. Dallinger, LL.D., F.R.S. 23 Plates and more than 800 Wood Engravings. 28*s.* Half Calf, 32*s.*; or, in two vols., sold separately, cloth, 14*s.* each.
Vol. I. The Microscope and its Accessories.
Vol. II. The Microscope, its Revelations.

The Microtomist's Vade-Mecum: a Handbook of the Methods of Microscopic Anatomy. By Arthur Bolles Lee. Sixth Edition. 15s. net.

The Quarterly Journal of Microscopical Science. Edited by E. Ray Lankester, M.A., LL.D., F.R.S.; with the co-operation of Adam Sedgwick, M.A., F.R.S., W. F. R. Weldon, M.A., F.R.S., and Sydney J. Hickson, M.A., F.R.S. Each Number, 10*s.*

Manual of Botany, in two Vols. By J. Reynolds Green, Sc.D., M.A., F.R.S., late Professor of Botany to the Pharmaceutical Society.
Vol. I. Morphology and Anatomy. Third Edition. 778 Engravings. 7*s.* 6*d.*
Vol. II. Classification and Physiology. Second Edition. 466 Engravings. 10*s.*

By the same Author.

An Introduction to Vegetable Physiology. 184 Illustrations. Second Edition. 10*s.* 6*d.* net.

Therapeutic Electricity and Practical Muscle Testing. By W. S. Hedley, M.D., in charge of the Electro-therapeutic Department of the London Hospital. 110 Illustrations. 8*s.* 6*d.*

A Manual for Hospital Nurses and others engaged in attending on the Sick. By Edward J. Domville, L.R.C.P.Lond., M.R.C.S.Eng., Surgeon to the Royal Devon and Exeter Hospital. Ninth Edition. 1*s.* 6*d.* net.

Nursing, General, Medical, and Surgical, with an Appendix on Sickroom Cookery and Dictionary of Medical Terms. By Wilfred J. Hadley, M.D., F.R.C.P., Physician to the London Hospital. Second Edition. 3*s.* 6*d.* net.

A Short Manual for Monthly Nurses. By Charles J. Cullingworth, M.D., F.R.C.P., Consulting Obstetric Physician to St. Thomas's Hospital. Sixth Edition. 1*s.* 6*d.* net.

St. Thomas's Hospital Reports. By the Medical and Surgical Staff. Vol. XXXIV. New Series. 8*s.* 6*d.* net.

Guy's Hospital Reports. By the Medical and Surgical Staff. Vol. XLV. Third Series. 10*s.* 6*d.* net.

LONDON

J. & A. CHURCHILL

7 GREAT MARLBOROUGH STREET

Med (Syncaccol)

Author Jellett, Sir Henry

Title Short Practice of Midwifery

94617

DATE.	NAME OF BORROWER.

UNIVERSITY OF TORONTO
LIBRARY

Do not remove the card from this Pocket.

Acme Library Card Pocket
Under Pat. "Ref. Index File."
Made by LIBRARY BUREAU, Boston